Food Science Event
Division B/C

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Outline

- Introduction to Food Science
- Explanation of Rules
- Examples of Laboratories
- Examples of Quizzes
- Useful Links and Publications
- Questions

What is Food Science?

- "Food Science is the discipline in which biology, physical sciences, and engineering are used to study the nature of foods, the causes of their deterioration, and the principles underlying food processing" (www.ift.org)
- The Science Olympiad Food Science Event is intended to test students' knowledge of laboratory methods and general topics in Food Chemistry

Introduction to Food Science

Food can be broken down into 3 major classes of components

- Carbohydrates
- Lipids
- Proteins

And include

- Water

- Carbohydrates
  - Sugars and starches
    - Structures
    - Bonds
    - Flavor attributes
- Lipids (fats)
  - Structures
  - Saturation levels
  - Melting points
- Proteins
  - Structures
  - Levels of folding
  - Amino acid components
- Water

- Water activity (free water)
- Moisture content
- Concentrations

Review of Rules

- Safety Requirements
  - Must wear:
    - Close-toed shoes
    - OSHA approved goggles
    - pants or skirts that cover the legs to the ankles
    - lab coat or apron
  - Unsafe removal of these leads to DQ
  - Unsafe use of equipment leads to DQ

- Event Parameters
  - Students must supply calculator and pen or pencil
  - Are advised to bring non-programmable calculator
  - Absolutely no reference materials, scientific instruments, or resource materials will be admitted
  - See resources at Science Olympiad webpage http://www.soinc.org/events/foodscience/index.htm

- Competition (Division B)
  - Students will be expected to perform lab tasks identifying carbohydrates, lipids, and proteins in foods
  - Students should be able to measure mass, volume, temp, and pH
    - Mass: use of balance
    - Temperature: use of digital or conventional thermometer
    - Volume: measurement could involve use of ruler, string, glassware, and water displacement
    - pH: use of litmus paper or pH meters
  - Students should be able to perform simple chemical/physical tests such as density, moisture content, and percent composition
    - Density: measurement of mass and volume
    - Moisture content: could include data or determination through drying
  - Detection tests may be performed such as:
    - Biurets test: protein
    - Benedicts test: sugar
    - Iodine reagent test: starch
    - Brown paper tests: fat

- Questions/Activities may also cover topics such as:
    - Leavening agents
    - Food additives
    - Vitamins and minerals
    - Caloric value
- 75% lab and 25% questions, may consist of stations
- Regional: students work together to complete all tasks
- State/National: students may need to work more independently

- Competition (Division C)
    - Students will be asked to perform lab task and/or answer written questions about food chemistry.
    - Series of stations that include activities similar to those in a first year HS science course
    - Could include
        - Hands-on activities
        - Interpretation of experimental data (graphs, diagrams, etc)
        - Observations in previously set-up expt
    - Students may be expected to interpret data presented in tabular and/or graphic format
    - Measurements must be recorded with correct significant figures and units
    - Stations might include the following topics or activities:
        - Simple tests for proteins, lipids, and various carbohydrates

- Sample Tasks and Lab Experiments (Division B)
    - Distinguish between lipids, carbohydrates, and proteins
    - Characterize carbohydrates as starches or sugars
    - Determine caloric value of food
    - Determine amount of iron in breakfast cereal
    - Differentiate between baking soda and powder based on chemical reaction
    - Determine melting points of fats
    - Rank Vitamin C content
    - Determine moisture content
    - Determine density
    - Determine percentage of constituent in food
    - Answer questions pertaining to foods label

- Sample Tasks and Lab Experiments (Division C)
    - Distinguish between lipids, carbohydrates, and proteins using reagents such as Benedict's solution, Biuret solution, Lugol's iodine, and Sudan IV

- Explain how the above reagents work in identification (reaction)
- When given generic structural formulas classify in one of the three main groups (lipids, carbs, proteins)
- Identify sugars as reducing/non-reducing or mono/poly saccharides
- Determine caloric value of food
- Determine moisture content
- Determine density
- Determine percentage of constituent in food
- Determine and explain different melting points in various fats
- Determine and explain boiling point differences in various solutions containing different solutes

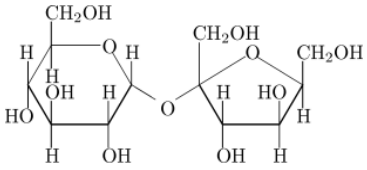
- Scoring
  - Laboratory portion (75%) and written portion (25%)
  - Points will be awarded for correct answers and/or proper techniques
  - Cleanup MUST occur after laboratories are completed or penalty in score may be imposed
  - Measurements/Calculations must be recorded in correct significant figures and units
  - Ties will be broken through pre-selected tie breaker questions not identified to the students

Main Points to teach:

- Carbohydrates
  - Consist of carbon, hydrogen, and oxygen (C:H:O of 1:2:1)

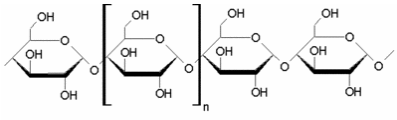
    - Sugars
      - Simplest carbohydrates
      - Monosaccharides: most common sugars in foods and can not be broken down further by hydrolysis
        - Most common ones in foods are hexoses or six-carbon sugars
        - Occuring in nature: glucose, mannose, galactose, fructose, and sorbose
      - Disaccharides: composed of two units of monosaccharides, can be two of the same or two different
      - Oligosaccharides: have between 2-10 monosaccharide units

- Different sugars have different levels of sweetness
- 4 Kcal/gram
- reducing sugar: type of sugar with ketone or aldehyde group



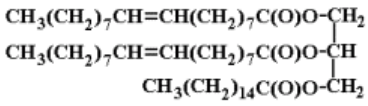
Disaccharide	Description	Component monosaccharides
sucrose	common table sugar	glucose + fructose
lactose	main sugar in milk	galactose + glucose
maltose	product of starch hydrolysis	glucose + glucose

- Starches
  - Polymer of glucose
  - Composed of amylose (linear compound) and amylopectin (branched compound) – plant based
  - 4 Kcal/gram
  - not readily soluble in cold water but when heated swell and gelatinize b/c of water uptake



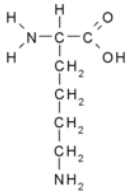
  - Cellulose can not be digested by humans (b/c of bonds)
  - Glycogen: animal starch that is highly branched glucose units
  - Fibers: non-digestible carbohydrates
    - Cellulose, pectin, and gums

- Lipids (Fats) **CH_2**COOR-**CH**COOR'-**CH_2**-COOR''
  - insoluble in water but soluble in nonpolar solvents
  - Fats and Oils and also includes waxes, phospholipids, and sterols
  - 9 Kcal/gram
  - Formation: alcohol plus acid produces an ester and water molecule. Glycerol is capable of forming three esters with different acid components. Fats/Oils are glyceryl esters of fatty acids
  - Contain carbon, hydrogen, and oxygen



- Fats may occur as solid or liquid at room temperature
- Melting points differ based on fatty acid components
- melting point differences, how are they changed (hydrogenation)
- Saturated: no double bonds
- Un-saturated: contains double bonds. Can be found in plant and animal sources
- Composed of Fatty Acids
  - C 19:1 (19 refers to carbons in chain, 1 refers to number of double bonds)

- Proteins (contain NH)
  - Proteins are composed of Amino Acids
  - Amino acids have the same general formula with differing R-groups
  - Proteins contain nitrogen, carbon, hydrogen, oxygen, and sometimes sulfur and phosphorus
  - Most proteins have about 16% nitrogen which is why when determining protein in foods the amount of nitrogen can be multiplied by 6.25 to quantify protein



  - 4 Kcal/gram
  - Four different protein structure classes (primary->quarternary)
  - Essential amino acids – can not be synthesized in the human body
  - Non-essential amino acids
  - Classes of amino acids include: polar but uncharged, non-polar, acidic, alkaline
  - Amino acids are linked together by peptide bonds
  - Solubility of proteins is determined by amino acids and their sequence
  - Denaturation: change in molecular structure that does not break covalent bonds or alter amino acid sequence, can be done with heat, acid, etc
  - Hydrolysis: cleaving of peptide bond by the addition of a water molecule
  - Enzymes are proteins

- Leavening Agents
  - Baking Powder versus Baking Soda
    - Baking Powder
      - Sodium bicarbonate plus acidifying agent (cream of tartar) and a drying agent (starch)
      - Activated by moisture
    - Baking Soda
      - Pure sodium bicarbonate
      - Must be mixed with moisture and an acidic ingredient

- Chemical reaction produces bubbles of carbon dioxide that expand under oven temperatures causing rising

Lab Examples

Titratable Acidity (C)

Determine the following information about the food item in front of you through the appropriate laboratory techniques.

1. Titratable Acidity:_____

    1. Place 10 mL of sample in beaker.
    2. Add 3-5 drops phenolphthalein indicator.
    3. Add NaOH from buret until solution turns pink. Swirl sample in beaker while doing this in order to mix.
    4. Calculate TA:

$$\% \text{ TA} = \frac{(\text{N of base}) \times (\text{mLs of base}) \times (\text{equwt acid})}{(\text{sample wt (g)}) \times 10}$$

Eq wt. = 90.08 mg/Eq
N of base = 0.1 N
Density of Milk = 1.033 g/mL

2. pH:_____

Answer the following questions concerning this food item.

3. Is this a low-acid or an acid food product? Explain why you chose this answer.

4. Titratable Acidity is calculated using the Equivalent Weight of the predominant acid in the food item. The food item you tested is milk, what is this predominant acid?

Starch and Sugar Determination (B or C)

Materials:
Ripe banana
Unripe banana
Iodine
Butter knives (1 per team)
Fehlings solution
Glucose solutions (0.5%, 1.0%, and 2.0%)

PART 1

Methods:

1. Cut a thin slice of green banana and a slice of dark ripe banana
2. Add a drop of iodine to the surface of each slice
3. Iodine will form a blue-black color when combined with starch. Using this information observe the results and answer the question below and in Part 2 of this experiment.

Questions:

5. Which of the bananas has more starch?

PART 2

Methods:

1. Label 3 test tubes as 0.5%, 1.0% and 2.0%.
2. Put 5 mL of Fehlings solution into each test tube.
3. Put 2 mL of the 0.5% glucose solution into the test tube labeled 0.5% and do the same for the 1.0 and 2.0% test tubes.
4. Briefly swirl each test tube.
5. Observe the results of each.
6. Label 2 additional test tubes as ripe and unripe.
7. Mash a slice of the unripe banana in the test tube labeled unripe and the ripe banana in test tube labeled ripe.
8. Add 10 mL of Fehlings solution to each.
9. Based on the observations you made of the first 3 test tubes with the glucose solutions answer the questions below.
10. Remember to clean up your lab area and all glassware!

Questions:

6. What color did the solution in 0.5% test tube turn after adding the Fehlings solution?

7. What color did the solution in the 1.0% test tube turn after adding the Fehlings solution?

8. What color did the solution in the 2.0% test tube turn after adding the Fehlings solution?

9. What color did the solution in the test tube labeled ripe turn?

10. What color did the solution in the test tube labeled unripe turn?

11. Based on the observations in Part 2 which banana has the most glucose?

12. Based on the observations in Part 1 & 2 what banana would you expect to have the sweetest flavor?

13. Slice off a small piece of each type of banana for you and your partner. Which of the two has the sweetest flavor?

14. Based on the observations in Part 1 & 2 where does the glucose come from? (limit your answer to one simple sentence)

Factors Affecting Yeast Growth – Sugars (B or C)

Materials:
125 ml Erlenmeyer flasks, 4
Balloons, 5
Sucrose, 5g
Fructose, 5g
Glucose, 5g
Lactose, 5g
Rapid-rise Yeast, 4 g each
Masking tape
Neutral pH tap water, 80 mL each
40˚C water bath

Methods:
1. Label flasks A through D.
2. Add 80 mL of tap water at 40˚C to each flask and dissolve 5g of each of the following sugars:
    a. Flask A- Fructose
    b. Flask B- Glucose
    c. Flask C- Sucrose
    d. Flask D- Lactose
3. Add 4 g of rapid-rise yeast to each solution and stir.
4. Place a balloon on each flask and seal it securely with masking tape.
5. Periodically stir the contents by spinning the flask slowly for 15 minutes.

Questions:

1. Rank the sugars in terms of their effectiveness in producing gas.
   Most effective >_____>_____> Least effective

2. Which sugar is commonly referred to as “table sugar”?

3. What gas is causing the inflation of the balloon?

4. Some of the sugars used above are disaccharides. If they are state what monosaccharides they are composed of. If they are not give the chemical formula
   a. Fructose: _____ & _____ OR _____
   b. Glucose: _____ & _____ OR _____
   c. Sucrose: _____ & _____ OR _____
   d. Lactose: _____ & _____ OR _____

Calcium Determination (C)

Materials:
50 mL buret
250 mL beaker
50 mL graduated cylinder
5 mL pipet
EDTA solution (disodium dihydrogen ethylenediaminetetraacetate)
Calmagite indicator solid
Buffer Solution of pH 10
0.010M Calcium Chloride Standard Solution
liquid food sample

Methods:
STUDENTS:

1. Rinse buret with EDTA solution and then fill buret with EDTA solution
2. Standardize EDTA
   a. Measure 50 mL of 0.01 M calcium chloride solution and put into a 250 mL beaker
   b. Pipet 1.0 mL buffer solution to beaker
   c. Add calmagite indicator (should turn pink)
   d. Record initial volume of EDTA and titrate solution until it turns light blue and again record volume

    e. Subtract volume measurements to find volume EDTA used to titrate and calculate the molar concentration of EDTA
    $(mL_{EDTA})(M_{EDTA}) = (mL_{Ca\ Soln})(M_{Ca\ Soln})$
3. Titration
    a. Measure 50 mL of sample and put into 250 mL beaker
    b. Pipet 1.0 mL buffer solution to beaker
    c. Add 2-3 drops calmagite indicator (should turn pink)
    d. Record initial volume of EDTA and titrate solution until it turns light blue and again record volume
    e. Subtract volume measurements to find volume EDTA used to titrate and calculate the molar concentration of calcium in sample
    $(mL_{EDTA})(M_{EDTA}) = (mL_{Ca\ Soln})(M_{Ca\ Soln})$

4. What is the molar concentration of the EDTA solution?
5. What is the molar concentration of calcium in the sample?
6. If the density of the liquid food sample is 1.003 mg/L what is the Molality of calcium in the sample?
7. How much of this liquid food sample would an individual need to consume in order to get the recommended 1300 mg/day? (Please give answer in mL)

Detection of Sucrose after Hydrolysis (B or C)

Materials:
Benedict's Solution
HCl
Hot Plate
Sodium Hydrogen Carbonate
Variety of Juices

Methods:
STUDENTS:
1. Place 6 mL juice in a test tube with 3 mL Benedict's solution.
2. Heat over flame or in hot water bath
3. If glucose present the color will gradually turn deep yellow or red.
4. If no color change occurs add 3 mL of dilute HCl into a tube with 6mL juice and boil the mixure.
5. Once cooled down some add 2 mL of dilute sodium hydrogen carbonate.
6. Add 3 mL Benedict's solution and repeat steps 2-3.

SUPERVISORS:
    Prepare solutions

Emulsion Stability (B or C)

Materials:
6 watch glasses
Mixture of Sudan III and methylene blue dyes (Sudan III is soluble in oil and methylene blue is soluble in water)
Milk, Cream
Butter, Margarine
Mayonnaise, Low-cal Spread, Salad Cream

Methods:
STUDENTS:

1. Sprinkle a small amount of dye onto the surface of each food on a watch glass.
2. Leave for a few minutes and observe which dye has colored the continuous phase
3. Determine which foods are water in oil emulsions and which are oil in water emulsions

SUPERVISORS:
No previous preparation needed

Energy Determination (B or C)

Materials:
Small bag of unsalted, shelled peanuts
Cork
Needle
Large metal can
Small metal can
Can opener
Hammer
Large nail
Metal BBQ skewer
Cup of water
Thermometer
Flame source

Methods:
STUDENTS:

1. Put the thermometer into the water and record the temperature.
2. Place the cork and peanut on a nonflammable surface
3. Light the peanut with a match or lighter

4. As soon as the peanut catches fire, place the large can around the nut.
5. Balance the skewer holding the small can on top of the large can
6. Allow the nut to burn for several minutes or until it goes out
7. Stir the water with the thermometer and record the temperature again.

SUPERVISORS:

1. Push the eye of the needle into the small end of the cork
2. Push pointed end of the needle into a peanut at a slight angle
3. remove ends of the large can with the can opener
4. using hammer and nail punch holes around the bottom of the can
5. remove the top end of the small can
6. pour ½ cup water into the small can and let sit at room temperature

Notes to Supervisor: For MS could have students determine temperatures but for HS have them calculate calories. This can be used for any category by giving the students the amount of 2 constituents and having them determine the final through the calorie content.

Molar Concentrations (B or C)

Description:
For this laboratory the supervisor should chose some type of compound or molecule and have the students make solutions of certain molarities with the substance. An idea for Middle School students would be to use kool-aid and prepare different concentrations or have the students prepare different concentrations.

Detection of Protein (B or C)

Materials:
Juice/Fruit
Biuret solution
Test tubes

Methods:
STUDENTS:

1. Place 5-10 mL juice in a test tube
2. Add 5-10 drops of Biuret solution
3. If protein is present the sample in the tube will turn purple in color.

SUPERVISORS:
Prepare solutions

Volume Determination of a Liquid and Solid (B or C)

Materials:
1000 mL graduated cylinder
balance
plum
500 mL of water
10 mL graduated cylinder
5 mL of milk

Methods:
STUDENTS:
Solids

1. Weigh to determine mass of a plum and record.
2. Fill a 1000mL graduated cylinder with 500mL of water.
3. Record the volume of water to two decimal places by reading the meniscus.
4. Place the plum into the cylinder with out displacing the water.
5. Read the new level of the meniscus to two decimal places.
6. Calculate the volume and density of the plum.
7. Repeat the procedure.
8. Calculate the % error of the two trials.

Liquids

1. Record the mass of a 10mL graduated cylinder.
2. Pour about 5mL of milk into the cylinder.
3. Determine and record the total mass of the cylinder and the milk.
4. Reading the bottom of the meniscus determine and record the volume of the milk to two decimal points.
5. Calculate the mass of the liquid and determine the density.
6. Repeat the procedure.
7. Calculate the % error for the two trials.

Composition – Protein (C)

Using the provided equipment and materials and by following the directions below determine the approximate percent by mass of protein in the sample. The sample is fat-free milk.

SUPERVISOR ADVICE: Before you start the experiment determine what weights you must have to do your calculations.

1. Heat the milk to at least 40°C in order for the milk to separate.
2. Obtain about 100mL of the milk and determine weight.

3. Add the acid (lemon juice) until it begins to curdle.
4. There will be no time to dry the casein protein to obtain accurate results, so you are just going to calculate the approximate percent by mass of the casein in the milk.
5. After you have completed the experiment rinse out your glassware and dispose of waste in proper containers.

Use your answer sheet to collect the necessary data and do the necessary calculations. Please show your work because you may receive partial credit if you arrive at the incorrect answer.

Density (B or C)

Use the materials provided to determine the densities of the following objects and answer the questions.

Determine the density of the potato.

Density=_____

Determine the average density of the tomatoes.

Density=_____

Which density value do you think is the most accurate? Why?

_____

_____

Moisture Content (B or C)

Use the materials and equipment to determine the moisture content of the 3 labeled samples and answer the questions.

$$\% \text{ Moisture Content} = \frac{(\text{mass of sample before drying}) - (\text{weight of sample after drying})}{\text{Mass of initial sample before drying}} \times 100$$

Samples:
All samples are the same material at different levels of moisture and are described here. Assume that all the dishes have the same weight, you are supplied with an empty dish to weigh.

Sample 1: original sample has not been dried at all
Sample 2: original sample dried for 1 hour
Sample 3: original sample dried for 24 hours

The moisture content for samples in percent:

1._____

2._____

3._____

Milk Sample Analysis (C)

Directions:

1) Weigh the empty graduated cylinder.
2) Record weight.
3) Measure out 5mL of Sample A in the graduated cylinder and weigh.
4) Record Weight.
5) Pour the measured 5mL of Sample A into a labeled test tube.
6) Rinse out graduated cylinder.
7) Repeat steps 3-6 for Sample B.
8) Using an eyedropper put 10 drops of Sudan IV into each prepared test tube and cover test tube with supplied cover.
9) Shake samples vigorously for 20 seconds as demonstrated by instructor.
10) Observe results.
11) Set samples in the provided beaker for 5 minutes and again observe and record results.
12) Use this information to answer the provided questions.

Questions:

1) What are the densities of the samples?
   Sample A_____
   Sample B_____
2) Sudan is a stain used to color fats. Based on this information and your observations from observing the samples prepared by the instructors which of the samples have the most fat? (Circle answer)
   Sample A Sample B
3) Based on your answers in Questions 1 & 2 do you think fat is more or less dense than water? (Circle answer)
   More Less

Moisture Content Determinations (B or C)

Directions:

Moisture Content (% Water in food product) is often determined through drying. The sample is dried in an oven at a specific temperature for a specified amount of time in order to evaporate all of the water present in the sample. The weight of the sample before and after drying is used to determine the amount of moisture evaporated from the sample.
Use the data given in the following table to fill in the blanks in the table.

To determine the moisture content % in the table use the following equation:

(Weight of Water Evaporated (g) / Final Weight of Sample (g)) x 100 = % Moisture Content

	Sample A	Sample B
Weight of dish (g)	3.98	4.05
Weight of dish with sample before drying (g): Initial	7.93	8.21
Weight of dish with sample after drying (g): Final	4.32	4.51
Weight of sample before drying (g): Initial		
Weight of sample after drying (g): Final		
Weight of water evaporated (g)		
Moisture Content of initial sample (%)		

Quiz Questions

Nutrition Facts – Calculations
Fill in the blanks on each nutrition label

Product 1: UNKNOWN

Nutrition Facts
Serving Size: ___g Net Weight: 44 g Servings Per Container: 9
Amount Per Serving
Calories: 110 Calories from Fat: 18
Total Fat: ____
Saturated Fat: 1g
Trans Fat: 0g
Cholesterol: 70mg
Sodium: 50mg
Total Carbohydrate: 11g
Dietary Fiber: 1g
Sugars: 5g
Proteins: ____

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Product 2: COLA

Nutrition Facts
Serving Size:1 can (12 oz) Net Weight:___oz Servings Per Container: 1
Amount Per Serving
Calories: 155 Calories from Fat: 0
Total Fat: 0 g
Saturated Fat: 0 g
Trans Fat: 0 g
Cholesterol: ____mg
Sodium: 15 mg
Total Carbohydrate: ___g
Dietary Fiber: ____g
Sugars: ____g
Starch:____g
Proteins: 0.2g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

PRODUCT 3: OLIVE OIL

Nutrition Facts
Serving Size: 13.5g Net Weight: 216g Servings Per Container:____
Amount Per Serving
Calories:_____ Calories from Fat:____
Total Fat: 13.5g
Saturated Fat: 1.8g
Polyunsaturated Fat: 1.4g
Monounsaturated Fat: 10.0g
Cholesterol: ___mg
Sodium: 0mg
Total Carbohydrate: ___g
Dietary Fiber: ___g
Sugars: 0g
Proteins: 0g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Name the following structures. If you do not know the exact names then tell whether it is more closely related to Carbohydrates, Proteins, or Fats.

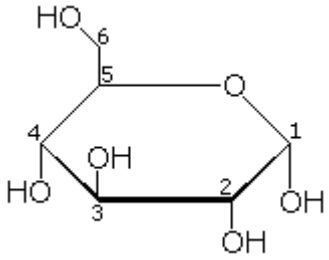


Figure 1

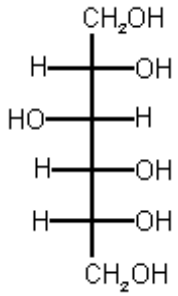


Figure 2

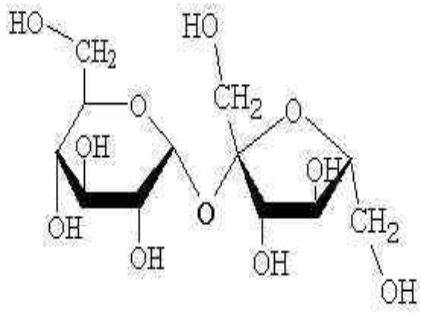


Figure 3

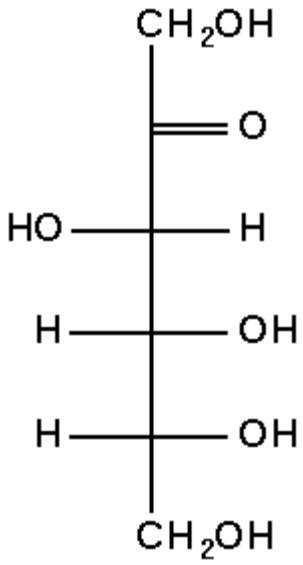


Figure 4

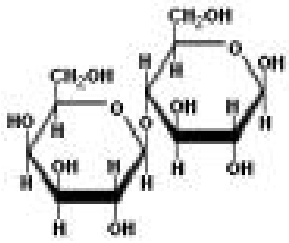


Figure 5

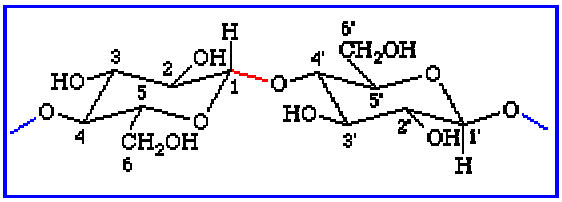


Figure 6

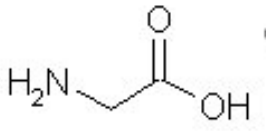


Figure 7

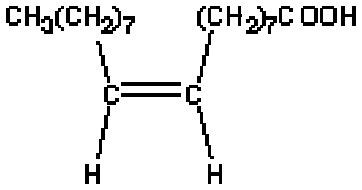
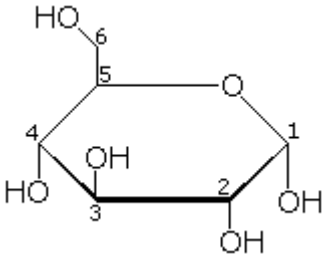
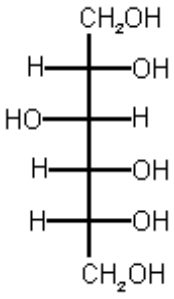


Figure 8

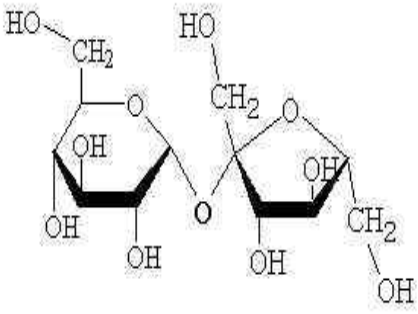
Name the following structures:



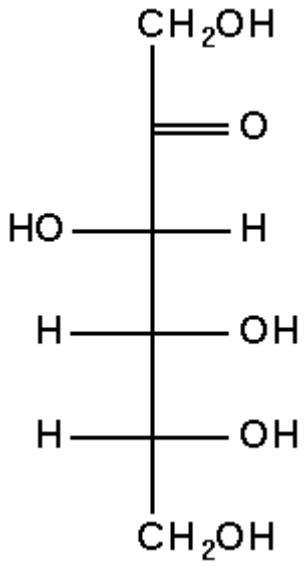
_____

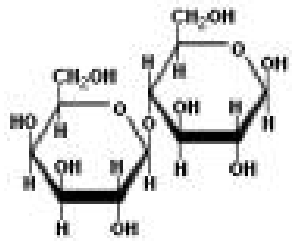


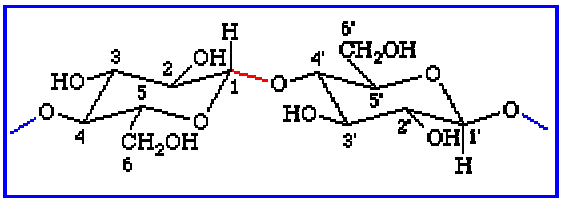
_____

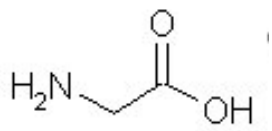


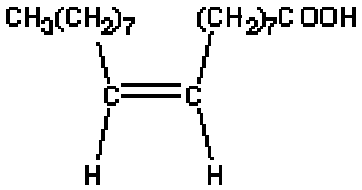
_____


CH2OH
O
HO
H
H
OH
H
OH
CH2OH






O
H2N
OH



_____

Determine If the following questions are T or F.

Carbohydrates in foods are made up of monosaccharides, oligosaccharides and polysaccharides. _____
Glucose and Fructose have different chemical structures.___
Lipids are carriers of fat-soluble vitamins._____
Trans fats are good for your health._____
Color, favor and texture are the primary attributes of food stability._____

Fish are high in ___ _____ fatty acids.

Which of the following has more fat:

a. one avocado
b. one chicken wing
c. one banana
d. a cup of broccoli

Which of these fats have hydrogens in their chemical structures.

a. saturated,
b. monounsaturated
c. polyunsaturated

Which of the following foods contain the lowest content of water?

a. carrots
b. tomatoes
c. whole milk
d. celery

Another name for adipose tissue is _____?

Lactase, Proteases, and Trypsin are examples of:

a. Lipids
b. Enzymes
c. Carbohydrates
d. Proteins

Which of the following has the highest amount of fat?

a. one cup honeydew

b. one large carrot
c. one can of cola
d. five green olives

Which of the following food items has the highest amount of protein?
a. one banana
b. a slice of chocolate cake
c. one cup of green beans
d. one chicken drumstick no skin

Which of the following types of fats contain double bonds?
a. saturated fats
b. unsaturated fats

The enzyme lipase will break down
a. lipids
b. proteins
c. sugars

Mark the following statements as True (T) or False (F).

Oxidation involves the loss of electrons.

High Density Lipoproteins (HDL) are commonly known as the “good cholesterol”.

Lactose is the sugar commonly referred to as table sugar.

Proteins contain nitrogen.

Starches and proteins are what give apples a sweet taste.

Soda/Cola gets its calories from fat.

Amino acids are what make up starches.

Disaccharides are made up of two monosaccharides.

Cellulose is a type of carbohydrate that can not be digested or broken down by the human body.

Nutrition Calculations:

One serving of a specific food product contains 11 grams of protein, 1 gram of sugar, 1 gram of dietary fiber, 5 grams of starch, 2 grams of unsaturated fat, and

5 grams of saturated fat. The serving contains about 10 grams of water as well and the total serving size is 36 grams. Proteins contribute 4 calories per gram, Carbohydrates contribute 4 calories per gram, and Fat contributes 9 calories per gram. How many calories are in one serving of this food? What percentage of calories are contributed by fat?

Total calories per serving:_____
% of Calories from fat:_____

What is a commonly used method to determine moisture content of foods?

a. drying
b. high performance liquid chromatography
c. water activity meter
d. ash determination

What is the equation of water activity?

a. a_w = water pressure of food item / water pressure of pure water
b. $a_w = P_i/P_o$
c. a_w=ERH/100 (ERH=effective relative humidity)
d. all of the above

What food item below has the highest amount of cholesterol?

e. one bag of potato chips fried in vegetable oil
f. one hamburger patty
g. two tablespoons of peanut butter
h. one head of lettuce

Match the following food items with the correct range of water activities.

Maple Syrup _____	A. ≤0.60
Potato chips _____	B. 0.85-0.93
Dried Fruit _____	C. ≥0.98
Fresh produce _____	D. 0.60-0.85