FOOD SCIENCE B

See General Rules, Eye Protection & other Policies on www.soinc.org as they apply to every event.

1. **DESCRIPTION:** Teams will study the science behind milk products and experiment with ingredients and other variables to produce and analyze results to produce the best dairy products below.

A TEAM OF UP TO: 2 **APPROXIMATE TIME:** 50 minutes

EYE PROTECTION: C **IMPOUND:** Yes **CALCULATOR:** Class III

2. **EVENT PARAMETERS:**
   a. Each participant may bring writing utensils.
   b. Each team may bring two Class III calculators
   c. Each participant may bring one 8.5" x 11" sheet of paper, which may be in a sheet protector sealed by tape or laminated, that may contain information on both sides in any form and from any source without any annotations or labels affixed.
   d. Each team may bring any or all of the items listed on the Division B Chemistry Events Lab Equipment List, posted on soinc.org, to use during this event.
   e. In addition to the Division B Chemistry events Lab Equipment List, teams will need to bring 1 pint size plastic bag, 1 gallon size plastic bag, a 500-600 mL container with a lid, and a piece of cheesecloth approximately 30 cm square. Teams not bringing these items may be at a disadvantage. The Supervisor will not provide them.
   f. Teams must wear goggles, an apron or a lab coat and have skin covered from the neck down to the wrist and toes. Gloves are optional, but if the host requires a specific type, they will notify teams. Pants should be loose fitting; if the host has more specific guidelines they will notify teams in advance of the tournament. Shoulder length or longer hair must be tied back. Participants removing safety clothing/ goggles or unsafely handling materials or equipment will be penalized, up to and including potential disqualification.
   g. Supervisors will provide necessary milk products (any type of milk may be provided including powdered), salts, lemon juice, vinegar, ice (if necessary), thermometers, or other reagents or equipment to complete the experimental activities. The provided quantity of milk product will be between 125 and 150 ml depending on which Lab is being used. The amounts provided shall be the same for each team.

3. **THE COMPETITION:**
   a. Notebook: Prior to the tournament, teams must perform 3 or more experiments related to each of the three Lab Tasks below. These experiments must be recorded on the Food Science Experiment Form (see on www.soinc.org) and must be placed together in the Notebook. Teams are encouraged to do more than nine experiments, but only the first 3 for each task will be graded. Each experiment will constitute one entry in the Notebook and each must have only one Independent Variable. The Notebook will be impounded prior to the start of the tournament for grading and returned to the teams at the end of the competition.
   b. At the tournament, teams will use the provided food materials to perform the tasks below. The number of tasks depends on the level of tournament: Regionals/Invitationals 1 task; State 1-2 task(s); Nationals 2-3 tasks.
      i. Ice Cream Formation: Teams will be provided the same amount of an unknown liquid milk product to prepare ice cream based on the provided materials and form the ice cream on a surface to obtain a height measurement by the Event Supervisor. Teams may use any amount of the provided ingredients. The ice cream formation must self-stand for 5 seconds before the measurement is taken. Students may hand shape the ice cream.
         (1) Combine up to 125 mL of milk, cream or half and half with up to 15 mL of sugar and add up to 1.2 mL of vanilla if desired.
         (2) Fill a 1-gallon Ziploc bag half-full with ice and add up to 90 mL of salt. Seal the bag and shake to mix the ice and salt.
         (3) In a 1 pint sized Ziploc bag place the ice cream mixture and seal the bag.
         (4) Place the smaller sealed bag in the large bag and mix and shake vigorously so that the ice cream mixture is cooled and mixed well.
         (5) After about 5-10 minutes, the ice cream can be removed from the smaller plastic bag.
      ii. Determine Curd Mass: Teams will be provided the same amount of an unknown liquid milk product to determine the mass (percentage of curd formation), which will be compared to the Event Supervisor's mass (percentage of curd formation).
         (1) Measure 120 mL of milk in the beaker and weigh the milk.

(2) The temperature of the milk should be close to room temperature.
(3) Add drops of vinegar or lemon juice to the milk and gently swirl (or stir) for 30 seconds, then allow the milk to sit for approx. 5 minutes.
(4) Drain the mixture through cheesecloth fastened over the top of a beaker collecting the curds in the cheesecloth.
(5) Let drain for 15 minutes.
(6) Determine the mass of the curds.

iii. Determine Milk Fat Mass from Cream: Teams will be provided the same amount of cream and will be asked to prepare butter to determine the Milk Fat Mass, which will be compared to the Event Supervisor's Milk Fat Mass.
(1) Transfer 150 mL of the heavy cream into a plastic 500-600 mL container and weigh the cream.
(2) The temperature of the cream should be approximately 13°C.
(3) Cap the bottle carefully and shake until a distinct separation of butter particles occurs.
(4) Drain off liquid portion and discard it.
(5) Determine the mass of the butter.

c. Test topics: Teams will take a written exam that covers only dairy food science topics such as: the role of lipids, carbohydrates and proteins typically found in dairy foods; standard labeling regulations; basic organic reactions such as esterification, fat bonding; saturated and unsaturated fats; chemical structure of sugars, starches, fats, and proteins; essential fats, vitamins, proteins; how cooking changes dairy foods chemically; allergens in dairy foods; dairy food preservation; RDA (recommended daily allowance) of essential minerals and vitamins in dairy foods and the consequences of not having them; freezing point depression; non-dairy 'milk' products; lactose free milk; health benefits of dairy foods; low fat, fat free milk; lactose intolerance; emulsification; pasteurization; organic dairy products; casein and whey proteins; probiotics.

4. **SCORING:**

a. High Score wins.
b. Final Score = Notebook Score + Lab Task(s) Score + Test Score - Penalties.
c. Notebook Score = Complete experiments receive up to 2 points each. Incomplete experiments receive fewer points (maximum 18 points).
d. Lab Tasks Score = Total of score(s) of required Lab(s)
i. Ice cream score = 0.1 pts for each mm (rounded off) of height
ii. Curd Mass and the Milk Fat Mass Scores = Team mass/Supervisor mass x 10 (e.g., Team get 2.4g Supervisor gets 2.5g = 0.96x10 = 9.6) (maximum 10 points each).
e. Test Score = Percentage correct/2 (maximum 50 points)
f. Penalties: Up to 10% of total possible score may be subtracted for failure to clean up as instructed.
g. Tie Breaker: Preselected questions on Test
h. Scoring Example: Notebook Score was 18, Ice cream height was 125mm, Curd mass score was 9.6, Test Score was 90%, No Penalties. Final Score = 18 + 12.5 + 9.6 + 90/2 = 85.1