Last Name: ma First Name: yimeng Group Number: 3b

Circle: (Tuesday) Thursday Date of Lab: 9 November 2014

FSM 120L Question Set – Western Human Nutrition Research Center

Total Points: 15

1. *In nutrition research, a primary goal of food production is to minimize nutrient variability in the foods and beverages that are provided to study participants. By converting all foods and beverages into gram weights, the research dietitian can minimize variability in menus and recipes. For example, one worker might interpret the abbreviation "tsp" as teaspoon, whereas another worker might interpret it as tablespoon. Similarly, one oz fluid measure should have been used. The USDA Nutrient Database for Standard Reference (http://ndb.nal.usda.gov/ndb/foods/list) is the primary tool that is used by the research dietitian to determine the gram weights of foods and beverages that are produced in the metabolic kitchen.*

   Use the above URL to convert the following recipe into grams (5 points)

Ingredients	Recipe	
	Household Measurements	**Gram Weights**
Potatoes, peeled	4 pounds (1 lb = 16 oz; 1 oz = 28.35 grams)	1814.4 grams
Salt *(Salt, table)*	1 teaspoon	6.0 grams
Stock, Fish *(Soup, stock, fish, home-prepared)*	6 quarts (1 qt = 4 cups; 1 cup = 233 grams)	5592.0 grams
Onion, chopped *(Onion, raw)*	2 cups (1 cup = 160 grams)	320.0 grams
Sauce, Hot Pepper *(Sauce, ready-to-serve, pepper, or hot)*	1 teaspoon	4.7 grams

* The italicized wording under each ingredient is the exact name of the ingredient on the USDA Nutrient Database for Standard Reference.

2. *The nutrient content of foods is not always the same. Some factors that affect nutrient composition include the following: product variety (e.g., navel vs. mandarin oranges), soil and growing conditions (e.g., hydroponically-grown vs. field-grown), climate (e.g., blueberries grown in Maine vs. blueberries grown in California), ripeness upon harvesting (e.g., ripened in an ethylene gas chamber vs. ripened on the vine), animal diets (e.g.,*

grain-fed vs. grass-fed, fertilizer and pesticide use in crops (e.g., some nutrients are more concentrated in plants that are stressed vs. plants that are not stressed), method of preparation (e.g., cooked vs. raw), length of storage (e.g., farmers' markets vs. grocery stores), cooking methods (e.g., boiling vs. steaming), length of cooking (e.g., al dente vs. mashed), shrinkage or expansion during cooking (e.g., meats shrink upon cooking whereas rice and pasta expand), and recipe reformulations in manufactured food products (e.g., meats comprising both animal and vegetable protein typically fluctuate in composition depending on current cost of meat and vegetable protein sources). One way that the research dietitian reduces nutrient variability in study diets is by purchasing foods and beverages in bulk lots.

Consider the following scenario: a research dietitian is planning to order food for a study. The study will last for 6 months, and 43 subjects will be enrolled (only 30 are needed to reach statistical power, but we are assuming a 30% drop-out rate for this study). A 2-day menu cycle will be used. Each participant will be fed for 7 days. Each day contains 1 casserole. The casseroles from Day 1 include carrots. The casseroles from Day 2 include broccoli. Casseroles will be assembled ahead of time and frozen.

If the edible portion quantity (EPQ) = as purchased quantity (APQ) x the yield percent (Y%), then determine the amount of fresh carrots and broccoli that will need to be purchased in order to prepare enough casseroles.

How many total casseroles with carrots will be prepared? (2 points)

43 subjects x 7 casseroles/subject = 301 casseroles total for the study

301 casseroles total x 4/7 days with carrots = <u>172 casseroles with carrots</u>

How many total casseroles with broccoli will be prepared? (2 points)

43 subjects x 7 casseroles/subject = 301 casseroles total for the study

301 casseroles total x 3/7 days with broccoli = <u>129 casseroles with broccoli</u>

Each Day 1 casserole contains 64.3 grams of peeled and diced carrots; each Day 2 casserole contains 44.8 grams of broccoli florets. Assume the percent yield from carrots without tops is 82%. Assume that each bundle of broccoli weighs 2 ½ pounds, and has a percent yield of 61%.

Assuming no other variables, how many pounds of carrots must be purchased? (1 point)

64.3 grams of carrots x 172 casseroles with carrots = 11059.6 grams of carrots total

11059.6 grams of use-able carrots x 18% = 1990.73 grams of carrot tops

1990.37 g carrot tops + 11059.6 g use-able carrots =

13,050.33 grams carrots total

1 pound carrots = 16 ounce x 28.35 grams/ounce = 453.6 grams of carrots

13,050.33 grams of carrots total / 453.6 grams of carrots (per pound) = 28.77 pounds of carrots = 29 pounds of carrots

Assuming no other variables, how many bundles of broccoli must be purchased? (1 point)

44.8 grams of broccoli x 129 casseroles with broccoli = 5779.2 grams of broccoli total

5779.2 grams of use-able broccoli x 39% = 2253.89 grams of broccoli non-florets

2253.39 g broccoli non-florets + 5779.2 g broccoli florets = 8,033.1 grams broccoli total

1 pound broccoli = 16 ounce x 28.35 grams/ounce = 453.6 grams of broccoli

8,033.1 grams of broccoli total / 453.6 grams of broccoli (per pound) = 17.7 pounds of broccoli

17.7 pounds of broccoli / 2.5 pounds per broccoli bundle = 7.08 bundles of broccoli (2.5 pounds each) = 8 bundles of broccoli (2.5 pounds each)

3. *A scientist just came to your office asking what size of incubator to purchase for preparing biofortified garri for an absorption study. Garri is a common food for people in West Africa that is made by fermenting cassava roots. Cassava is a staple crop for poorer regions of the world, but is not a good source of carotenoids. The scientist will be ordering standard cassava that is biofortified with beta-carotene, which will then be made into garri. The goal of the study is to determine the bioavailability of beta-carotene in the biofortified garri as compared to garri made from standard cassava.*

   Your job is to make the most cost-effective purchase of an incubator for the study. Assuming no other variable, you will ferment 65 kg of peeled and diced cassava into garri in one batch. Show your calculations (4 points = 2 points for the correct answer, 2 points for showing your calculations).

   Hint: 1 cup of diced potatoes without skin = 14.4 cubic inches

   Hint: 1 cup = 156.0 grams

   INCUBATORS

   SMALL: 14.5 in x 13.9 in x 20 in (4031 cubic in); cost = $1,600

   MEDIUM: 14.5 in x 18.3 in x 23.9 in (6342 cubic in); cost = $2,800

   LARGE: 21.4 in x 18.3 in x 27.9 in (10,926 cubic in); cost = $5,400

   65.0 kg cassava = 65,000 grams cassava

   14.4 cubic inches (1 cup) = 156.0 grams

   65,000 grams cassava / 156.0 grams per cup = 416.67 cups of cassava

   416.67 cups x 14.4 cubic inches per cup = 6,000 cubic inches

   The most cost effective size of incubator is: MEDIUM ($2800 for 6342 cubic inches)