Chemistry of Foods
Margarine Lab

Margarine Lab (adapted from "Density", Chem Matters, Oct. 1990)

Many people use margarine as a replacement for butter in their diets. They are often trying to avoid the saturated fats often found in butter, as diets that are too high in saturated fats tend to result in heart disease.

Today we are going to get a chance to see the fat content of various types of margarine.

We are going to be calculating the densities and percent compositions of the different margarines. To do this, you will need two equations:

Density =

% Fat (by volume) =

We will also use our knowledge of lipids and food labels to identify various "mystery" food products.

Procedure:

1. Get the mass of a small beaker. Record that here: _____.
2. Obtain approximately 2-3 Tablespoons of your assigned margarine, put it into your beaker, and get the mass again. Record that number here: _____.
3. Using your data from step 1 and 2, determine the mass of your sample of margarine. Record it in the data table on the next page.
4. Warm the beaker gently on a hot plate until the margarine melts. Once the margarine is melted, use "hot hands" to pour the mixture into a 100 mL graduated cylinder.
5. Let the graduated cylinder stand for about 10 – 15 minutes or until distinct layers between the fat (actually partially hydrogenated vegetable oil) and the water form.
6. Read the volume of each layer and fill in your data table below. Take time to think – where would the oil be and where would the water be in the graduated cylinder? Which is more dense? *Have Mrs. Carlson check your numbers **before** you get rid of your margarine.*
7. Thoroughly wash your beaker and your graduated cylinder and return them to Mrs. Carlson.
8. Get data for the other 2 margarines that you did not do from the other groups.

Data:

Type of Margarine	Mass of Margarine (grams)	Total Volume of Margarine (mL)	Volume of Water (mL)	Volume of Oil (mL)
A				
B				
C				

Calculations and Questions

1. Calculate and record the density of each type of margarine. Show your work below:

   A

   B

   C

2. Which margarine (A, B or C) was the most dense?

3. Which type of fats tend to be more dense – saturated or unsaturated?

4. Look at the saturated fat amounts on the food labels of the margarine in the classroom. Does it match your answer to #2? Explain why or why not this is the case.

5. Calculate and record the percent of fat/oil for each type of margarine. Show your work below:

A

B

C

6. Which has the greater density, fat/oil or H_2O? How could you tell in your lab?

Extension Questions

At the end of this lab you will find the labels from six different food products. The six food product labels come from **peanut butter, butter, olive oil, margarine, light margarine, and American cheese.** Out of these six, peanut butter and American cheese are definitely different than butter and margarine.

1. What is something you would find on a food label that peanut butter would be "high" in that butter, margarine, and light margarine wouldn't really have?

2. Which label must be peanut butter, then?

3. What is something you would find on a food label that cheese would be "high" in that butter and margarine wouldn't really have? (Hint: It's good for your bones and your teeth)!

4. What label must be cheese, then?

5. The remaining four food labels are from oil, margarine, light margarine or butter. Of these four food labels, only one is *naturally* a solid at room temperature.
    a. When something is a solid, what type of fat is it generally made up of?

    b. Where does this type of fat usually come from (plants or animals)?

    c. Which label (A-F) is predominantly made up of this type of fat, and the *only* food associated with your answer to part b?

    d. What is this label (olive oil, margarine, light margarine or butter)?

6. Of your remaining three food labels, only one of these is a liquid.
    a. When something is a liquid, what type of fat is it generally made up of?

    b. Where does this type of fat usually come from (plants or animals)?

    c. Which label (A-F) is predominately made up of this type of fat? (Hint: Look at serving sizes for an extra clue)!

    d. What is this label (olive oil, margarine, light margarine or butter)?

7. The remaining two products are made from soybean oil, but are sold as "solids" at room temperature. What process did these products need to go through to become a "solid?"

8. Crisco (shortening) undergoes the same process that is mentioned in #7. Many people *incorrectly* think that shortening and lard are the same thing. Explain why they are wrong. Where does shortening "come from" versus where does lard "come from?"

9. Look at your remaining two food labels. You should be able to distinguish one from the other now. Identify the last two labels (olive oil, margarine, light margarine or butter) below.

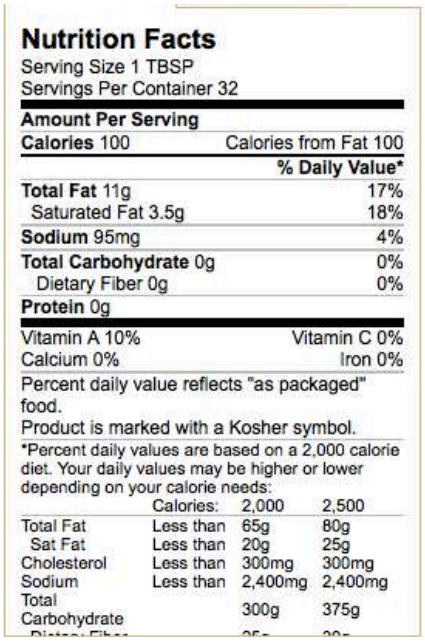
    a. Label _____ is _____.

    b. Label _____ is _____.

10. Which food product would likely contain more saturated fats – "stick" margarine or "tub" margarine? (Hint: Think about texture).

11. Explain *why* you chose the answer you did in #10. Your answer should include an explanation about the types of fat and their states of matter.

Label A



Nutrition Facts

Serving Size 1 TBSP
Servings Per Container 32

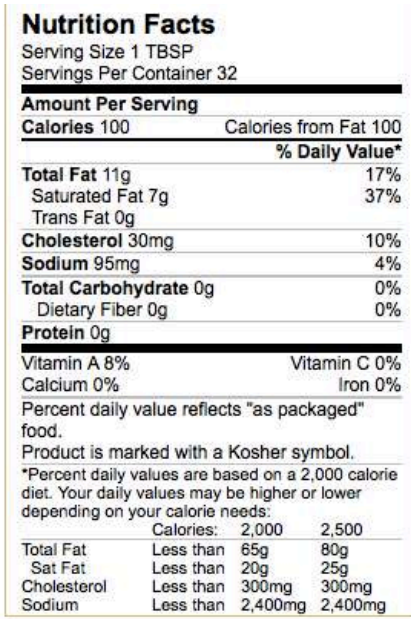
Amount Per Serving	
Calories 100	Calories from Fat 100
	% Daily Value*
Total Fat 11g	17%
Saturated Fat 3.5g	18%
Sodium 95mg	4%
Total Carbohydrate 0g	0%
Dietary Fiber 0g	0%
Protein 0g	
Vitamin A 10%	Vitamin C 0%
Calcium 0%	Iron 0%

Percent daily value reflects "as packaged" food.
Product is marked with a Kosher symbol.

*Percent daily values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g

Label B



Nutrition Facts

Serving Size 1 TBSP
Servings Per Container 32

Amount Per Serving	
Calories 100	Calories from Fat 100
	% Daily Value*
Total Fat 11g	17%
Saturated Fat 7g	37%
Trans Fat 0g	
Cholesterol 30mg	10%
Sodium 95mg	4%
Total Carbohydrate 0g	0%
Dietary Fiber 0g	0%
Protein 0g	
Vitamin A 8%	Vitamin C 0%
Calcium 0%	Iron 0%

Percent daily value reflects "as packaged" food.
Product is marked with a Kosher symbol.

*Percent daily values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg

Label C

NUTRITION FACTS
Serving Size 1 tbsp (15mL)
Servings Per Container about 95

Amount Per Serving
Calories 120
Calories from Fat 120

	% Daily Value*
Total Fat 14g	22%
Saturated Fat 2g	10%
Trans Fat 0g	
Polyusaturated Fat 8g	
Monounsaturated Fat 4g	
Cholesterol 0mg	0%
Sodium 0mg	0%
Total Carbohydrate 0g	0%
Protein 0g	

Not a significant source of dietary fiber, sugars, vitamin A, vitamin C, Calcium, and iron.

* Percent Daily Values are based on a 2,000 calorie diet.

Label D

Nutrition Facts
Serving Size 2 TBSP
Servings Per Container 14

Amount Per Serving

Calories 190	Calories from Fat 130
	% Daily Value*
Total Fat 16g	24%
Saturated Fat 2.5g	13%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 140mg	6%
Total Carbohydrate 8g	3%
Dietary Fiber 2g	9%
Sugars 3g	
Protein 7g	

Vitamin A 0%	Vitamin C 0%
Calcium 0%	Iron 4%

Percent daily value reflects "as packaged" food.
Product is marked with a Kosher symbol.

*Percent daily values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg

Label E

Nutrition Facts
Serving Size
Servings Per Container 24

Amount Per Serving

Calories 60	Calories from Fat 40
	% Daily Value*
Total Fat 4.5g	7%
Saturated Fat 2.5g	13%
Trans Fat 0g	
Cholesterol 15mg	5%
Sodium 230mg	10%
Total Carbohydrate 1g	0%
Dietary Fiber 0g	0%
Sugars 1g	
Protein 3g	

Vitamin A 2%	Vitamin C 0%
Calcium 20%	Iron 0%

Percent daily value reflects "as packaged" food.

*Percent daily values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg

Label F

Nutrition Facts
Serving Size 1 TBSP
Servings Per Container 32

Amount Per Serving

Calories 70	Calories from Fat 70
	% Daily Value*
Total Fat 7g	11%
Saturated Fat 1.5g	8%
Trans Fat 1.5g	
Cholesterol 0mg	0%
Sodium 105mg	4%
Total Carbohydrate 0g	0%
Dietary Fiber 0g	0%
Protein 0g	

Vitamin A 10%	Vitamin C 0%
Calcium 0%	Iron 0%

Percent daily value reflects "as packaged" food.
Product is marked with a Kosher symbol.

*Percent daily values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg