Before you begin, identify the ingredients below

<table>
<thead>
<tr>
<th>Ingredient</th>
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<tbody>
<tr>
<td>oleo ester</td>
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<tr>
<td>emulsion of milk fat</td>
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<tr>
<td>gelatin gum/air sugar solution</td>
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<tr>
<td>sucrose</td>
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<tr>
<td>theobroma cacao pellets</td>
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<tr>
<td>vanillin</td>
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</tbody>
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Everyone loves fudge, but did you know that there is actually chemistry behind making it?! It is so easy (and fun) to make with friends!

**FUN WITH FUDGE!**

SUBMITTED BY LAKELAND HIGH SCHOOL, LAKELAND, FL

### INGREDIENTS

- 1/4 cup evaporated emulsion of milk fat
- 1 cup sucrose
- 1/2 stick oleo esters
- 4 oz theobroma cacao pellets
- 8 pieces gelatin gum/air sugar solution
- 1/4 tsp vanillin

### EQUIPMENT

- Non-laboratory hot plate
- Saucepan
- Oven mitt
- Wooden spoon
- Cake pan
- Aluminum foil

### INSTRUCTIONS

1. Line the cake pan with foil and butter the foil.
2. Combine the evaporated milk, sugar and butter in the saucepan.
3. Place the saucepan on the hot plate at high setting stirring constantly.
4. When the mixture starts to boil, start timing for 5 minutes. Stir for the entire 5 minutes.
5. After boiling for 5 minutes, take the saucepan off the heat and stir in the chocolate chips.
6. When the chocolate is completely melted, add the marshmallows and vanilla. Stir well.
7. Pour the mixture into the foil-lined cake pan and let cool.
8. Submit a small sample of the reaction product for the instructor to test.

### TIPS

- This fudge tastes great hot or cold, in case you can’t wait until it cools to eat it. It’s very sugary so avoid consuming large amounts.

### SAFETY

- A hot plate is used, which can cause burns. Avoid touching or reaching over the hot plate for any reason.
- Do not touch the pan without an oven mitt.
- Use caution when stirring chocolate chips into hot solution.

### TO THINK ABOUT

- How does each ingredient/temperature affect the viscosity of the fudge?
- Why does the fudge need to be heated? Refrigerated?

### DID YOU KNOW?

Fudge is one of the rare exceptions to the rule that sugar crystals are not desirable in candy. However, the size of the crystals make a difference. Tiny sugar crystals in fudge are what give it its firm texture, but the crystals need to be small enough that they don’t feel grainy on your tongue, but smooth.

### REFERENCES