



*The Society of Flavor Chemists, Inc.*<sup>®</sup>

## THE SYLLABUS

*Syllabus: " A summary outline of a discourse, treatise, or course of study or of examination requirements."  
-Webster's New Collegiate Dictionary*

This document is an elaboration of article II, 2,c of the Society of Flavor Chemists' By-laws, which states that applicants for Certified Membership "must exhibit a working knowledge of...raw materials, laboratory procedures, production processes, legal/regulatory considerations, and the economics involved in the creation, production, and utilization of flavors."

The syllabus is intended to provide support and guidance to training programs. It is the expected knowledge from which the Membership Committee draws their interview questions.

No attempt has been made to divide the subject matter into Certified and Apprentice SFC membership categories. It is the expected that Certified members will have broader and deeper knowledge than Apprentice members, but it is not the intention here to elaborate who should know what. It is not likely that someone will know everything.

Since there are no formal courses in Flavor Chemistry, most of a candidate's knowledge and training must come from work experience, trial and error, and the counsel of more experienced practitioners of the art. In addition, most people will find it useful or necessary to supplement their experience by consulting various published sources of information. Some examples of these are:

1. Steffan Arctander, *Perfume and Flavor Chemicals, Perfume and Flavor Materials of Natural Origin*
2. Burdock, *Fenaroli's Handbook of Flavor Ingredients*
3. Dolf DeRovira, *The Dictionary of Flavors*
4. Ernest Guenther, *The Essential Oils*
5. Dr. Brian Lawrence, *Essential Oils*
6. Joseph Merory, *Food Flavorings: Composition, manufacture, and use*
7. Earl Merwin, *Flavor History*
8. Morrison and Boyd, *Organic Chemistry*
9. Gerald Mosciano, *Successful Flavors*
10. Gary Reineccius, *Flavor Chemistry and Technology, Source Book of Flavors*
11. John Wright, *Flavor Creation*
12. Allured Publishing, *Flavor and Fragrance Materials*
13. Code of Federal Regulations (CFR)
14. Food Chemical Codex
15. Industry periodicals including:
  - Perfumer & Flavorist
  - Journal of Agricultural & Food Chemistry
  - Food Technology
  - Food Processing
  - Food Engineering
  - Cereal Food World
  - Prepared Foods
  - Food Chemical News
  - Food Product Design
  - Beverage World

**I. BASIC ORGANIC CHEMISTRY****A. Structures**

- Hydrocarbons
- Carboxylic Acids
- Alcohols
- Aldehydes
- Esters
- Ketones
- Macrocyclic compounds
- Lactones
- Nitrogen compounds
- Phenols
- Amino Acids
- Reducing Sugars
- Ethers
- Furans
- Salts
- Sulfur Compounds
- Terpenes
- Sesquiterpenes
- Isomers: cis & trans ; dextro & laevo
- Sensates

➤ **\*DEFINE EACH STRUCTURE AND GIVE EXAMPLES**

**B. Reactions**

- Acetal formation
- Enzymolysis
- Esterification
- Fermentation
- Maillard Reaction
- Oxidation
- Polymerization
- Schiff's Base
- Strecker Degradation
- Aldol Condensation

➤ **\*DESCRIBE WHICH STRUCTURES ARE INVOLVED, CONDITIONS REQUIRED AND HOW TO ACCELERATE OR INHIBIT THE REACTION**

**II. INSTRUMENTAL ANALYSIS**

- Density Meter
- Gas Chromatograph (GC)
- High Performance Liquid Chromatograph (HPLC)
- Mass Spectrometer (MS)
- Nuclear Magnetic Resonance (NMR)
- Polarimeter
- Refractometer

➤ **\*DISCUSS PRINCIPLES AND APPLICATIONS**

**III. ORGANIZATIONS AND REGULATORY****A. Flavor Industry and Related Organizations**

- British Society of Flavor Chemists (BSF)
- Chemical Sources Association (CSA)
- European Flavour & Fragrance Association (EFFA)
- Flavor and Extract Manufacturers Association (FEMA)
- Flavor Heritage Society
- Food Chemical Codex (FCC)
- International Organization for Standardization (ISO)
- International Organization of the Flavor Industry (IOFI)
- National Association of Fruits, Flavors, and Syrups (NAFFS)
- Society of Flavor Chemists (SFC)
- United States Pharmacopoeia (USP)

**B. Trade Organizations**

- American Association of Cereal Chemists (AACC)
- American Spice Trade Association (ASTA)
- Institute of Food Technologists (IFT)
- Research Chefs Association (RCA)
- Mint Industry Research Council (MIRC)
- International Chewing Gum Association (ICGA)
- National Confectioners Association (NCA)

**C. Regulatory**

- Alcohol, Tobacco, Tax & Trade Bureau (TTB, formerly BATF)
- Code of Federal Regulations Volume 21 (21 CFR)
- Drug Enforcement Administration (DEA)
- Expert Panel
- Food Allergen Research and Resource Program (FARRP)
- Food and Drug Administration (FDA)
- Joint Expert Committee of Food Additives (JECFA)
- United States Department of Agriculture (USDA)

**D. Environmental/Safety**

- Consumption Ratio
- Environmental Protection Agency (EPA)
- Good Manufacturing Practices (GMP's)
- Hazardous Material Identification (HMIS)
- Occupational Safety and Health Administration (OSHA)

**E. Procedures and Documentation**

- |  |                                      |
|--|--------------------------------------|
| • Certificate of Analysis (COA)        | • ISO 9000                           |
| • Continuing Letter of Guarantee       | • Kosher Certification               |
| • Department of Transportation (DOT)   | • Material Safety Data Sheets (MSDS) |
| • Flavor Ingredient Data Sheets (FIDS) | • Natural Certification              |
| • Halal Certification                  | • Specifications                     |

**IV. CATEGORIES OF FLAVORING SUBSTANCES****A. Natural**

Explain physical form, method of production and solubility of:

- |                                     |   |
|-------------------------------------|---|
| • Absolutes                         | • Essential Oils                          |
| • Concentrates: fruits              | • Extracts: fluid, solid, CO <sup>2</sup> |
| • Concretes                         | • Oleoresins                              |
| • Distillates: fruit, cocoa, coffee | • Resinoids                               |
| • Enzymatic Modified Cheeses        |   |

Categories (give examples of each):

- |   |  |
|---|--|
| • Floral  | • Spice  |
| • Citrus: explain how and why products are concentrated, washed, etc. | • Vanilla: explain standard of identity, extraction, folding, etc. |

Major chemical component which characterizes aroma/flavor of:

- Almond
- Anise
- Basil
- Bergamot
- Bois de Rose
- Capsicum
- Caraway
- Cassia
- Cinnamon: bark and leaf
- Clove
- Coriander
- Dill
- Eucalyptus
- Lavender
- Lemon
- Marjoram
- Mustard
- Neroli Bigarade
- Orange
- Orris
- Peppermint
- Spearmint

### **B. Nature Identical**

Define and give examples

### **C. Artificial**

Define and give examples

## **V. LEGAL CONSIDERATIONS**

### **A. Labeling**

#### **1. Flavor Declaration**

- Artificial
- Natural
- Natural Flavor Type
- Natural WONF
- Non-characteristic
- TTB Natural
  - Artificial topnote
  - Exemptions to topnote limitations
  - Potability

#### **2. Solvents**

- Types: Water soluble, Oil soluble
- Advantages/disadvantages/limitations

#### **3. Acidulants and Buffers**

#### **4. Carriers**

- Gums
- Salts
- Starches
- Sugars

#### **5. Colors: FD&C, Lakes**

#### **6. Preservatives**

- Types
  - Antimicrobial
  - Antioxidant
- Natural/Artificial

**B. Standard of Identity**

Define and give examples

**C. Genetically Modified Organisms****D. Allergens****E. Organic Foods****VI. FLAVOR FORMS****A. Liquid**

- Water- soluble
- Oil-soluble
- Emulsions

**B. Dry**

- Plated
- Powders
- Spray Dry
- Drum Dry
- Other encapsulations processes

**C. Pastes**

- Enzyme modified products

- Describe processing procedures
- Explain solvents, carriers, etc. used for each and the finished products to which they are applied.
- Discuss advantages/disadvantages of each, such as shelf life stability.

**VII. ORGANIC CHEMICALS USED IN FLAVORS**

Name two chemicals which occur naturally in and characterize the flavor of:

- Apple
- Banana
- Blueberry
- Butter
- Cherry
- Cocoa
- Coffee
- Cream
- Grape
- Honey
- Lemon
- Orange
- Peach
- Peanut
- Raspberry
- Strawberry

What chemicals could be used to modify a flavor and make it:

- riper?
- creamier?
- Fresher?
- Browner?
- Juicier?
- Sweeter?

What chemicals would fall into the following descriptive categories?

- Dairy
- Floral
- Green
- Fruity
- Minty
- Pulpy
- Spicy
- Fatty
- Waxy
- Brown
- Nutty
- Earth