the ifra green chemistry compass

IFRA Green Chemistry Compass Webinar and Opening of Public Consultation

July 20, 2023

The International Fragrance Association

beyondbenign green chemistry education

Agenda

1. Welcome, Antitrust Statement and purpose of this webinar
2. The IFRA Green Chemistry Compass Background and Rationale
3. Disclaimer
4. Compass overview/demonstration of tool
5. Q&A with panel
6. Next steps: Call for Action to join the consultation

Martina Bianchini
President, **IFRA**

IFRA Antitrust Statement

IFRA, its members and all participants in the meeting must comply with all relevant antitrust laws and shall not discuss or communicate commercially sensitive information such as pricing, production, or market strategy. If these rules are contravened, participants should voice their concerns immediately

The IFRA-IOFI Sustainability Charter provides the Rationale for Green Chemistry Action

01 RESPONSIBLE SOURCING of all raw materials

Partnerships with communities

Labor practices & human rights

Sustainable use of ecosystems, biodiversity

02 ENVIRONMENTAL FOOTPRINT

GHG emissions

Energy consumption

Water intake

Waste & circular economy

Green chemistry

We are inspired by Green Chemistry Principles

03 SAFE, ATTRACTIVE and REWARDING WORKPLACE CULTURE

Occupational health & safety

Equal opportunities, diversity & inclusion

Training & development

04 PRODUCT SAFETY and DESIGN

Safe-by-design (for consumers **and the environment**)

Product stewardship

Alternatives to animal testing

05 TRANSPARENCY

Ethics & integrity

Stakeholder dialogue & collaboration

https://ifrafragrance.org/priorities/sustainability

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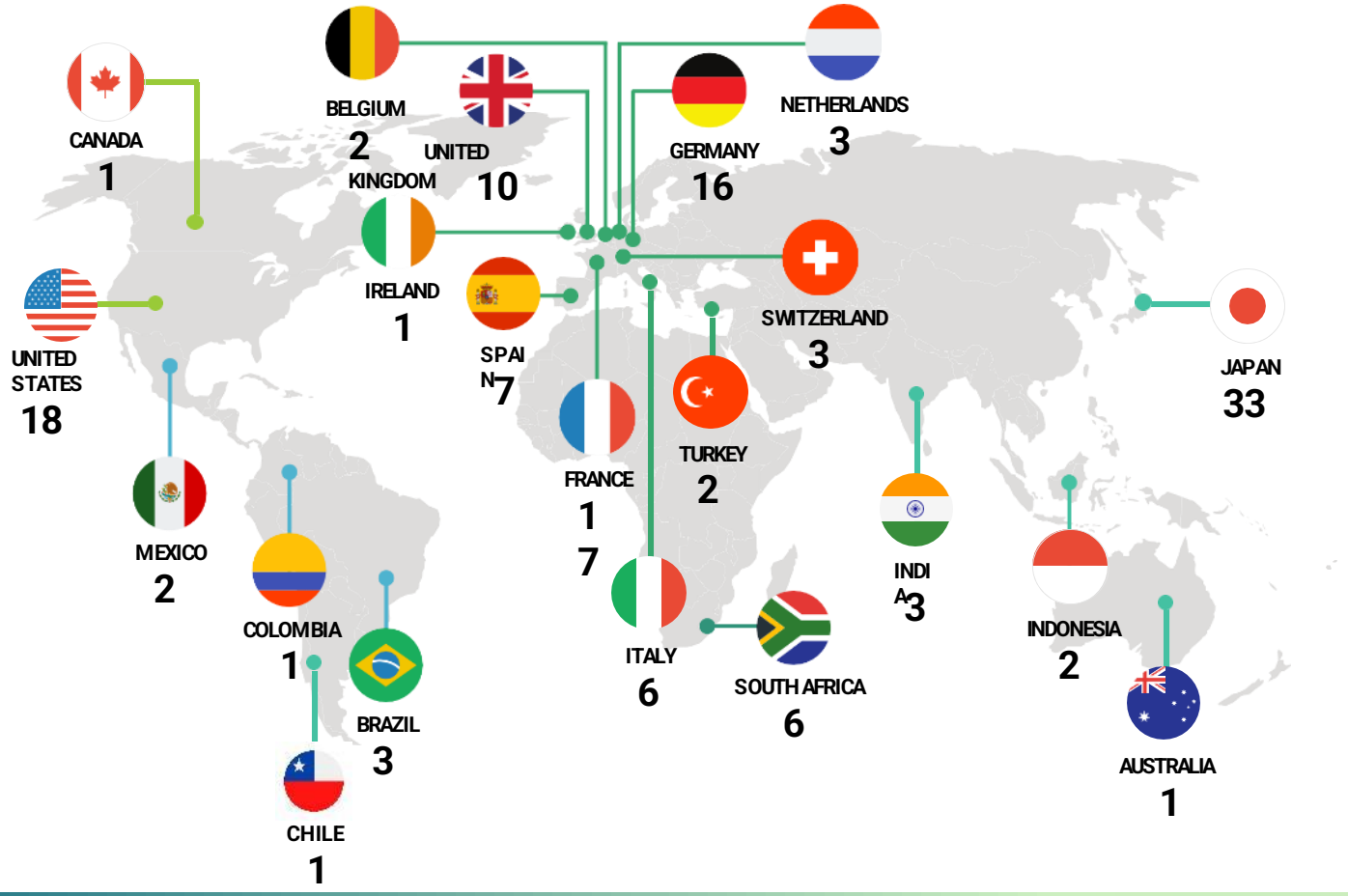
The IFRA-IOFI Sustainability Charter has been signed by 138 companies, large and small

National/regional breakdown by signatory company headquarters



19	NORTH AMERICA
7	LATIN AMERICA
67	EUROPE
6	AFRICA
39	ASIA-PACIFIC

The Second IFRA-IOFI Sustainability Report was launched on June 5, 2023

- Further developed since its 2020 launch and the first Report in 2021, 'Charter 2.0' reinforces an ambitious approach to sustainability
- Updated text covers alternatives to animal testing, Green Chemistry, workplace culture, ‘essentiality’ of flavors and fragrances
- Since 2021, more companies have fulfilled or are making progress towards fulfilling the 17 Charter commitments
- The 2023 Report also covers the activities of the new Sustainability Committee, the Sustainability Community, and work on carbon footprint, deforestation, Green Chemistry, and harmonised definitions
- Found out more at ifra-iofi.org/report

The IFRA Green Chemistry Compass has four Objectives

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1. Design a tool to implement our Sustainability Charter element 2.3.
2. Raise awareness of the 12 Principles of Green Chemistry and prioritize those Green Chemistry Principles relevant for the fragrance industry and turn them into an actionable tool to enrich the Sustainability Charter toolbox.
3. The Compass tool provides direction for scientists and other industry professionals towards the conscious design of greener, safer and more sustainable chemical choices.
4. The Compass tool is inclusive, voluntary, global and open to all interested stakeholders through a public consultation.

IFRA Green Chemistry Compass Background and Timeline

- ***2022 (Feb):*** Identified project team through call for volunteers (including Advisory Committee)
- ***2022 (March, June, Sept):*** Held 3 informational webinars for IFRA-IOFI community (featuring Dr. John Warner, co-founder of Green Chemistry field)
- ***2022 – 2023:*** Held regular monthly team meetings working on content for Green Chemistry Compass in consultation with Committee members
- ***2023 (April – May):*** Conducted pilot testing of the IFRA GC Compass with Committee member companies
- ***2023 (July – October):*** Launch the GC Compass with an open 3-month consultation period

IFRA GC Compass Advisory Committee

- Martina Bianchini, IFRA (co-chair)
- Amy Cannon, Beyond Benign (co-chair)
- Markus Eh, Symrise
- Jörg Thilo Fischer, Symrise
- Cyril Gallardo, MANE
- Elena Galiano, IFF
- Hans Holger Gliewe, IFRA
- Richard Illi, SFFIA/Essencia
- Paul D Jones, IFF
- Hiroyuki Matsuda, Takasago
- Takaji Matsumoto, Takasago
- Maxime Marchall – IOFI (Observer)
- Bhuvana Nageshwaran, Ultra International
- Thierry Roger, Robertet
- Amy Perlmutter, Beyond Benign
- Tony Phan, MANE
- Lei Samekto, IFRA
- Francesco Santoro, Firmenich
- Gaetesh Tampy, IFF
- Hazal Ustundag George, Firmenich
- Marta Varela, IFRA
- Jonathan Warr, Takasago (chair of IFRA-IOFI Sustainability Committee)

Scope and Disclaimer: The IFRA Green Chemistry Compass is:

- still in development
- a general guidance tool for how to consciously design greener, safer and more sustainable chemical choices
- a simplified high-level overview tool looking gate to gate, suitable for in-house assessment; not to be shared externally
- not meant to determine whether a product meets the EU Safe and Sustainable by Design (SSbD) criteria which are still under development
- not a substitute for a company's own due diligence on ingredients and processes
- compliments other tools used by industry
- helps identify opportunities for improvement

Under no circumstances shall IFRA be liable for any loss or damage of any kind arising from use of this Compass.

Today's Presenters and Panelists

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Amy S. Cannon
Executive Director and Co-Founder, **Beyond Benign**

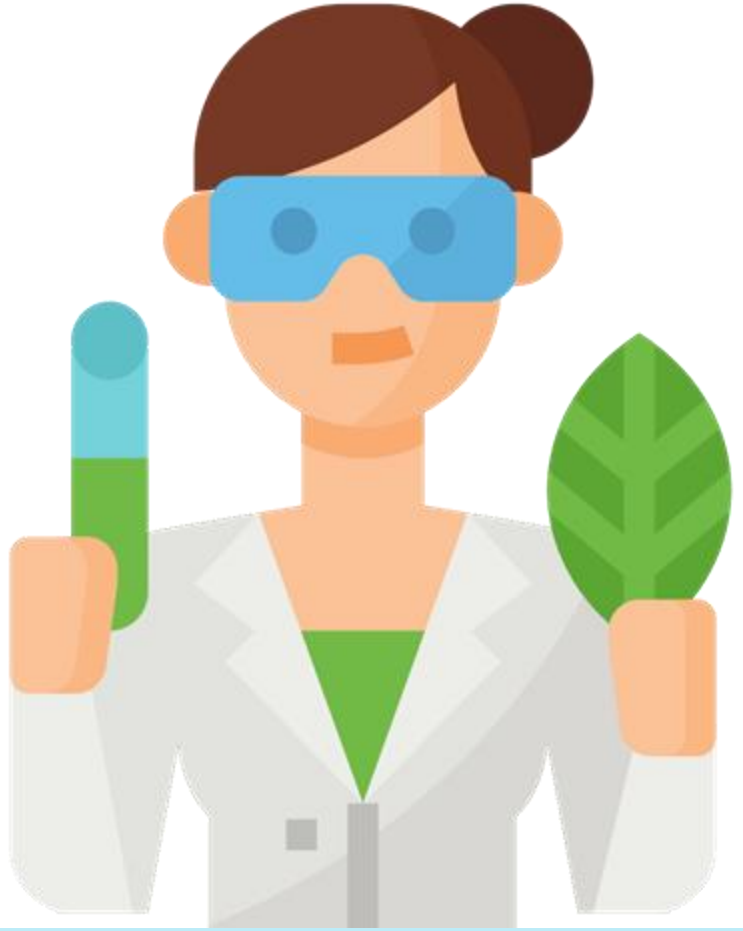
Amy Perlmutter
Principal, **Perlmutter Associates**

Jonathan Warr
Chair IFRA–IOFI Sustainability Committee, **Takasago International Corporation**

Tony Phan
Naturals Production and Methods Manager, **MANE**

What is Green Chemistry?

"The utilization of a set of principles that reduces or eliminates the use or generation of hazardous substances in the design, manufacture, and application of chemical products."



- **Environmental and health benefit**
- **Economically profitable**
- **Effective**

↓ RISK = ↓ HAZARD x ↓ EXPOSURE

Anastas, P. T.; Warner, J. C. *Green Chemistry: Theory and Practice.* Oxford University Press: 1998.
TechNavio. *Global Green Chemicals Market 2019-2023,* 2019.

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Product

Raw materials & starting materials

Process

End-of-life

Anastas, P. T., Warner, J. C., Green Chemistry Theory and Practice, 1998, Oxford University Press

We aligned the 5 Pillars of the IFRA-IOFI Sustainability Charter with the 12 Principles of Green Chemistry

	1.Waste Prevention	2.Atom Economy	3.Less Hazardous Chemical Synthesis	4.Designing Safer Chemicals	5.Safer Solvents & Auxiliaries	6.Design for Energy Efficiency	7.Use of Renewable Feedstocks	8.Reduce Derivatives	9.Catalysis	10.Design for Degradation	11.Real-Time Pollution Prevention	12.Safer Chemistry for Accident Prevention
Responsible Sourcing	■				■		■		■	■		
Environmental footprint and climate change	■	■			■	■	■	■	■	■	■	■
Well-Being of Employees			■		■						■	■
Product Safety			■	■								■
Transparency and Partnerships	■	■	■	■	■	■	■	■	■	■	■	■

We prioritized 9 Green Chemistry Principles against the 5 Pillars of the IFRA-IOFI Sustainability Charter and developed a tool with 8 Questions

	1.Waste Prevention	2.Atom Economy	3.Less Hazardous Chemical Synthesis	4.Designing Safer Chemicals	5.Safer Solvents & Auxiliaries	6.Design for Energy Efficiency	7.Use of Renewable Feedstocks	8.Reduce Derivatives	9.Catalysis	10.Design for Degradation	11.Real-Time Pollution Prevention	12.Safer Chemistry for Accident Prevention
Responsible Sourcing							Question 1					
Environmental footprint and climate change	Question 4					Question 2			Question 3	Question 5		
Well-Being of Employees			Question 6		Question 7							Question 6
Product Safety				Question 8								
Transparency and Partnerships												

How does the IFRA Green Chemistry Compass Work?-- Overview

- Download the Excel Workbook with tabs containing instructions, data needs, definitions, and 8 questions that cover ingredients, processes, waste, energy, catalysts, and solvents
- The 8 questions should be completed for **one** individual product
- Answers are automatically ranked by Most Preferred, Needs Improvement, or Least Preferred
- Provides summary that shows opportunities for improvement in each of 8 categories– goal should be moving all towards Most Preferred
- Gathering all required information beforehand will make the completion of Compass quick

GC Compass: Guiding Questions

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Category and Question
Responsible Sourcing
1. Is the product derived or extracted in whole or in part from a renewable, BMB, carbon capture resource?
Environmental footprint & Climate Change
2. a) To what extent is the process for making this product energy intensive? b) Is renewable energy used in whole or in part in the process?
3. a) What type of catalyst, if any, is used in this process? b) What is the mol-recycle number for the catalyst used (if applicable)?
4. How much waste is generated in the process?
5. To what extent is the product or formulation biodegradable?
Well-Being of Employees
6. What type of solvents are used?
7. Do the reagents or raw materials pose any physical, health or environmental hazards?
Product Safety
8. Does the product pose any physical, health or environmental hazards?

the green chemistry compass

Responsible Sourcing

UN SDGs

#15 Life on Land

#12 Responsible Consumption & Production

#8 Decent work & economic growth

GREEN CHEMISTRY PRINCIPLES

#7 Use of Renewable Feedstocks

GC Compass Question 1

Compass Tool designed by:

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Renewable Resources

Enter product or process name:

Product test name

Question 1: Is the product derived or extracted in whole or in part from a renewable, Biomass Balance (BMB) or carbon capture resource?

--> Insert % of product that is derived from renewable, Biomass Balance, and/or Carbon Capture resources. [Do Not Include "%" - ie. 65]

Response	Score

Definitions
Carbon from renewable natural resources are natural resources that, after exploitation, can return to their previous stock levels by natural processes of growth or replenishment (1). The % renewable carbon can be identified by the C13/C14 ratio (ASTM D6866). (https://www.astm.org/d6866-22.html)
Biomass Balanced (BMB) carbon is a relatively new concept where a certain quantity of renewable feedstock is mixed with conventional fossil feedstock as starting material. Following the production process, a quantity of final product can be certified against the quantity of renewable feedstock used (2). Certification standards for the final product are REDcert-EU (3) and ISCC (4).
Carbon capture is also a new concept where atmospheric CO2 is transformed into an organic compound. Today there are few if any examples for fragrance materials. Certification standards are not yet established.
(1) A typical fragrance example would be essential oils as a natural extract and DH myrcenol as a synthetic ingredient made from a pine oil starting material.
(2) The two most common renewable feedstocks linked to fragrance today are bio-methane and
(3) RedCert EU https://certifications.controlunion.com/en/certification-programs/certification-programs/redcert-biomass-for-energy
(4) ISCC certification https://www.iscc-system.org/

Data to gather
Carbon origin of final product including % renewable carbon (C13/C14 ratio by ASTM D6866), Biomass Balance data, or carbon capture information (if available).

More Information
This indicator helps companies understand where their materials come from and how to minimize environmental harm by shifting from petroleum and making sure feedstocks are truly renewable or recyclable. The goal is to move away from virgin fossil inputs which contribute to climate change. Note that to claim BMB it is anticipated that the relevant actors are all certified (as in for Roundtable on Sustainable Palm Oil (RSPO)-MB).

Enter Response

What data is needed?

What does this mean?

Additional Information?

Intro & Instructions | Data Needed for Compass | Definitions | Q1_Resources | Q2_Energy Efficiency Use | Q3_Catalyst | Q4_Waste Generation | Q5_Biodegradability | Q6_Solvents

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Responsible Sourcing

UN SDGs

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GREEN CHEMISTRY PRINCIPLES

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Response	Score
75	Needs Improvement

Score is automatically populated

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Environmental footprint & climate change

UN SDGs

#12 Responsible Consumption & Production

#9 Industry, Innovation & Infrastructure

#13 Climate Action

GREEN CHEMISTRY PRINCIPLES

#1 Pollution Prevention
#2 Atom Economy
#6 Design for Energy Efficiency
#9 Catalyst
#10 Design Degradation

GC Compass Question 2-5

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Energy Efficiency

Enter product or process name:

Product test name

Question 2: a) To what extent is the process for making this product energy intensive?
b) Is renewable energy used in whole or in part in the process?

	Response	Score
Step 1: Enter either (A) your process temperature and pressure conditions or (B) your LCA Data		
--> A: Insert your process temperature in Celcius (leave blank if using LCA data)		
--> A: Insert your pressure condition in atm / bars (leave blank if using LCA data)		
--> B: Insert your LCA data (carbon footprint, kg CO2/kg material) (Leave blank if using temperature and pressue)		
Step 1 Score		

Step 2: Enter the percentage of renewable energy that is used in whole or in part of the process [enter in whole number ie. 55]

--> Insert the percentage of renewable energy used in the process; If there is no renewable energy used, input '0' to report Final Score.

FINAL Score

Option for process conditions or LCA data (kg CO_2/kg material)

Intro & Instructions | Data Needed for Compass | Definitions | Q1_Resources | Q2_Energy Efficiency Use | Q3_Catalyst | Q4_Waste Generation | Q5_Biodegradability

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Energy Efficiency

Enter product or process name:

Product test name

Environmental footprint & climate change

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	Response	Score
Step 1: Enter either (A) your process temperature and pressure conditions or (B) your LCA Data		
--> A: Insert your process temperature in Celcius (leave blank if using LCA data)	25	Needs Improvement
--> A: Insert your pressure condition in atm / bars (leave blank if using LCA data)	5	
--> B: Insert your LCA data (carbon footprint, kg CO2/kg material) (Leave blank if using temperature and pressue)		
Step 1 Score	**Needs Improvement**	
Step 2: Enter the percentage of renewable energy that is used in whole or in part of the process [enter in whole number ie. 55]		
--> Insert the percentage of renewable energy used in the process; If there is no renewable energy used, input '0' to report Final Score.		
FINAL Score		

Part B: Type of energy used (renewable?)

+ ≡ Intro & Instructions | Data Needed for Compass | Definitions | Q1_Resources | Q2_Energy Efficiency Use | Q3_Catalyst | Q4_Waste Generation | Q5_Biodegradability

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Step 1: Enter either (A) your process temperature and pressure conditions or (B) your LCA Data		
--> A: Insert your process temperature in Celcius (leave blank if using LCA data)	25	Needs Improvement
--> A: Insert your pressure condition in atm / bars (leave blank if using LCA data)	5	
--> B: Insert your LCA data (carbon footprint, kg CO2/kg material) (Leave blank if using temperature and pressue)		
Step 1 Score	**Needs Improvement**	
Step 2: Enter the percentage of renewable energy that is used in whole or in part of the process [enter in whole number ie. 55]		
--> Insert the percentage of renewable energy used in the process; If there is no renewable energy used, input '0' to report Final Score.	75	
FINAL Score	**Most Preferred**	

Final score is adjusted based on % renewable energy

Intro & Instructions | Data Needed for Compass | Definitions | Q1_Resources | Q2_Energy Efficiency Use | Q3_Catalyst | Q4_Waste Generation | Q5_Biodegradability

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GC Compass Question 2-5

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Question 3: a) What type of catalyst, if any, is used in this process? b) What is the mol-recycle number for the catalyst used (if applicable)?

Step 1: What type of catalyst, if any, is used in this process:

--> Mark an "X" to the left of all the catalysts used in the process, or mark an "X" to the left of no catalysts responses or "Do not know".

Response

Bio-based Catalysts	
	Enzymes
	Bio-based catalyst

No catalysts	
	No - we use Stoichiometric reagents
	No - not relevant for this process
	Do not know

Metal-based Catalysts	
	Au
	B
	Bi
	Co
	Cu
	Li
	Mg
	Mn
	Mo
	Nb
	Ni
	P
	Pd
	Sb
	Sc
	Se
	Sn
	Sr
	Tl
	Y
	V
	W
	Y
	Zr

Scarce (low-moderate hazard) Catalysts	
	Ag
	Ge
	Hf
	Ir
	Os
	Pt
	Ru
	Rh
	Ta
	Te
	Zn

Scarce (high hazard) Catalysts	
	As
	Pb
	Cd
	Cr
	Ga
	Hg
	In
	U

Step 1 Score:

Step 2: What is the mol-recycle number for the catalyst used

--> Insert is the mol-recycle number (turnover number (TON)) for the catalyst in this process:

FINAL Score

Check-list of types of catalyst(s) used

Preference to Enzyme/bio-based catalysts and abundant/less hazardous metals

Definitions | Q1_Resources | Q2_Energy Efficiency Use | Q3_Catalyst | Q4_Waste Generation | Q5_Biodegradability | Q6_Solvents | Input Hazard Statements | Q7_Process Safety & Haza

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	Au
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	Mg
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	Mo
	Nb
	Ni
	P
	Pd
	Sb
	Sc
	Se
	Sn
	Sr
	Tl
	Y
	V
	W
	Y
	Zr

Scarce (low-moderate hazard) Catalysts	
	Ag
	Ge
	Hf
	Ir
	Os
	Pt
	Ru
	Rh
	Ta
	Te
	Zn

Scarce (high hazard) Catalysts	
	As
	Pb
	Cd
	Cr
	Ga
	Hg
	In
	U

Step 1 Score: **Needs Improvement**

Step 2: What is the mol-recycle number for the catalyst used

--> Insert is the mol-recycle number (turnover number (TON)) for the catalyst in this process:

FINAL Score **Needs Improvement**

Check-list of types of catalyst(s) used

Preference to Enzyme/bio-based catalysts and abundant/less hazardous metals

Turn over number/mol-recycle number can improve the score

Definitions | Q1_Resources | Q2_Energy Efficiency Use | Q3_Catalyst | Q4_Waste Generation | Q5_Biodegradability | Q6_Solvents | Input Hazard Statements | Q7_Process Safety & Hazards | Q

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	Co
X	Cu
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	Mo
	Nb
	Ni
	P
	Pd
	Sb
	Sc
	Se
	Sn
	Sr
	Tl
	Y
	V
	W
	Y
	Zr

Scarce (low-moderate hazard) Catalysts	
	Ag
	Ge
	Hf
	Ir
	Os
	Pt
	Ru
	Rh
	Ta
	Te
	Zn

Scarce (high hazard) Catalysts	
	As
	Pb
	Cd
	Cr
	Ga
	Hg
	In
	U

Step 1 Score: **Needs Improvement**

Step 2: What is the mol-recycle number for the catalyst used

--> Insert is the mol-recycle number (turnover number (TON)) for the catalyst in this process: **1000**

FINAL Score **Most Preferred**

Definitions | Q1_Resources | Q2_Energy Efficiency Use | Q3_Catalyst | Q4_Waste Generation | Q5_Biodegradability | Q6_Solvents | Input Hazard Statements | Q7_Process Safety & Hazards

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	Mo
	Nb
	Ni
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	Pd
	Sb
	Sc
	Se
	Sn
	Sr
	Tl
	Y
	V
	W
	Y
	Zr

Scarce (low-moderate hazard) Catalysts	
	Ag
	Ge
	Hf
	Ir
	Os
	Pt
	Ru
	Rh
	Ta
	Te
	Zn

Scarce (high hazard) Catalysts	
	As
	Pb
	Cd
	Cr
	Ga
	Hg
	In
	U

Step 1 Score: **Needs Improvement**

Step 2: What is the mol-recycle number for the catalyst used

--> Insert is the mol-recycle number (turnover number (TON)) for the catalyst in this process: **500**

FINAL Score **Needs Improvement**

Definitions | Q1_Resources | Q2_Energy Efficiency Use | Q3_Catalyst | Q4_Waste Generation | Q5_Biodegradability | Q6_Solvents | Input Hazard Statements | Q7_Process Safety & Hazards

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GC Compass Question 2-5

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Waste Generation

Enter product or process name:

Product test name

Question 4: How much waste is generated in the process?

	Response	Score
--> Insert the E-Factor for the process in the response.		

Definitions
E-Factor = Total mass of waste from process ÷ total mass of product
Waste generation, for this purpose, is calculated using the Environmental Impact Factor (E-Factor). Waste includes both solid and liquid waste and any materials not included in the final product, or used for other purposes (such as a by-product used for another process).*
**Sheldon, R. A., The E factor 25 years on: the rise of green chemistry and sustainability, Green Chem., 2017,19, 18-43, DOI: https://doi.org/10.1039/C6GC02157C*

More Information
Waste reduction in chemical processes can reduce the overall environmental footprint of a product lifecycle, therefore reducing overall impacts on ecosystems. Waste generation is a measure of the efficiency of the manufacturing process.
Additional metrics include Process Mass Intensity (sum of mass of materials/mass of isolated product), used extensively in the pharmaceutical industry, and atom economy (MW of product ÷ Sum of MW's of all reactants) x 100

the ifra green chemistry compass

Environmental footprint & climate change

UN SDGs

#12 Responsible Consumption & Production

#9 Industry, Innovation & Infrastructure

#13 Climate Action

GREEN CHEMISTRY PRINCIPLES

#1 Pollution Prevention

#2 Atom Economy

#6 Design for Energy Efficiency

#9 Catalyst

#10 Design Degradation

GC Compass Question 2-5

Compass Tool designed by:

The International Fragrance Association

beyondbenign green chemistry education

Waste Generation

Enter product or process name:

Product test name

Question 4: How much waste is generated in the process?

--> Insert the E-Factor for the process in the response.

Response	Score
100	Least Preferred

Definitions
E-Factor = Total mass of waste from process ÷ total mass of product
Waste generation, for this purpose, is calculated using the Environmental Impact Factor (E-Factor). Waste includes both solid and liquid waste and any materials not included in the final product, or used for other purposes (such as a by-product used for another process).*
**Sheldon, R. A., The E factor 25 years on: the rise of green chemistry and sustainability, Green Chem., 2017,19, 18-43, DOI: https://doi.org/10.1039/C6GC02157C*

Data to gather
Total mass of process waste; total mass of product (or E-factor of process)

More Information
Waste reduction in chemical processes can reduce the overall environmental footprint of a product lifecycle, therefore reducing overall impacts on ecosystems. Waste generation is a measure of the efficiency of the manufacturing process.
Additional metrics include Process Mass Intensity (sum of mass of materials/mass of isolated product), used extensively in the pharmaceutical industry, and atom economy (MW of product ÷ Sum of MW's of all reactants) x 100

Definitions | Q1_Resources | Q2_Energy Efficiency Use | Q3_Catalyst | Q4_Waste Generation | Q5_Biodegradability | Q6_Solvents | Input Hazard Statements | Q7_Process Safety & Hazards

Most Preferred:
E-factor ≤ 5

Needs Improvement:
5-25

Least Preferred:
Above 25

the ifra green chemistry compass

Environmental footprint & climate change

UN SDGs

#12 Responsible Consumption & Production

#9 Industry, Innovation & Infrastructure

#13 Climate Action

GREEN CHEMISTRY PRINCIPLES

#1 Pollution Prevention

#2 Atom Economy

#6 Design for Energy Efficiency

#9 Catalyst

#10 Design Degradation

GC Compass Question 2-5

Compass Tool designed by:

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Biodegradability

Enter product or process name:

Product test name

Question 5: To what extent is the product or formulation biodegradable?

--> Use the drop down in the Response cell to the answer that best describes the product or formulation

Response

Score

Use the drop down to select answer

Qualifications:

Greater than or equal to 60% biodegradable within 28 days = **Readily biodegradable**

More than 20% and less than 60% biodegradable = **Inherently biodegradable**

Less than 20% biodegradable = **Persistent**

Definitions
Biodegradation is the process by which carbon-based substances are broken down by living organisms, ultimately to inorganic end products (such as water or carbon dioxide) and biomass. It can proceed in the presence (aerobic biodegradation) or absence (anaerobic biodegradation) of oxygen. Persistence is the length of time that a compound is able to remain in the environment after being introduced into it. Some compounds may persist indefinitely. [OECD definition]

Data to gather
Screening test data on biodegradability (OECD 301A-F) (https://www.oecd-ilibrary.org/environment/test-no-301-ready-biodegradability_9789264070349-en)

More Information
OECD guidance on testing degradation of organic chemicals: https://www.oecd.org/chemicalsafety/testing/5598432.pdf

the ifra green chemistry compass

Environmental footprint & climate change

UN SDGs

#12 Responsible Consumption & Production

#9 Industry, Innovation & Infrastructure

#13 Climate Action

GREEN CHEMISTRY PRINCIPLES

#1 Pollution Prevention

#2 Atom Economy

#6 Design for Energy Efficiency

#9 Catalyst

#10 Design Degradation

GC Compass Question 2-5

Compass Tool designed by:

The International Fragrance Association

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Biodegradability

Enter product or process name:

Product test name

Question 5: To what extent is the product or formulation biodegradable?

--> Use the drop down in the Response cell to the answer that best describes the product or formulation

Response	Score

'Readily biodegradable

'Inherently biodegradable

'Persistent

Use the drop down to select answer

Qualifications:

Greater than or equal to 60% biodegradable within 28 days = **Readily biodegrad**

More than 20% and less than 60% biodegradable = **Inherently biodegra**

Less than 20% biodegradable = **Persistent**

Definitions
Biodegradation is the process by which carbon-based substances are broken down by living organisms, ultimately to inorganic end products (such as water or carbon dioxide) and biomass. It can proceed in the presence (aerobic biodegradation) or absence (anaerobic biodegradation) of oxygen. Persistence is the length of time that a compound is able to remain in the environment after being introduced into it. Some compounds may persist indefinitely. [OECD definition]

Data to gather
Screening test data on biodegradability (OECD 301A-F) (https://www.oecd-ilibrary.org/environment/test-no-301-ready-biodegradability_9789264070349-en)

More Information
OECD guidance on testing degradation of organic chemicals: https://www.oecd.org/chemicalsafety/testing/5598432.pdf

Definitions | Q1_Resources | Q2_Energy Efficiency Use | Q3_Catalyst | Q4_Waste Generation | Q5_Biodegradability | Q6_Solvents | Input Hazard Statements | Q7_Process Safety & Haz

the ifra green chemistry compass

Biodegradability

Enter product or process name:

Product test name

UN SDGs

#12 Responsible Consumption & Production

#9 Industry, Innovation & Infrastructure

#13 Climate Action

GREEN CHEMISTRY PRINCIPLES

#1 Pollution Prevention
#2 Atom Economy
#6 Design for Energy Efficiency
#9 Catalyst
#10 Design Degradation

GC Compass Question 2-5

Compass Tool designed by:

The International Fragrance Association

beyondbenign green chemistry education

Question 5: To what extent is the product or formulation biodegradable?

--> Use the drop down in the Response cell to the answer that best describes the product or formulation

Response	Score
Readily biodegradabl	Most Preferred

Qualifications:

Greater than or equal to 60% biodegradable within 28 days = **Readily biodegradable**

More than 20% and less than 60% biodegradable = **Inherently biodegradable**

Less than 20% biodegradable = **Persistent**

Definitions
Biodegradation is the process by which carbon-based substances are broken down by living organisms, ultimately to inorganic end products (such as water or carbon dioxide) and biomass. It can proceed in the presence (aerobic biodegradation) or absence (anaerobic biodegradation) of oxygen. Persistence is the length of time that a compound is able to remain in the environment after being introduced into it. Some compounds may persist indefinitely. [OECD definition]

Data to gather
Screening test data on biodegradability (OECD 301A-F) (https://www.oecd-ilibrary.org/environment/test-no-301-ready-biodegradability_9789264070349-en)

More Information
OECD guidance on testing degradation of organic chemicals: https://www.oecd.org/chemicalsafety/testing/5598432.pdf

the ifra green chemistry compass

Solvents

Enter product or process name:

Product test name

Well-being of employees

UN SDGs

- #8 Decent Work & Economic Growth
- #5 Gender Equality
- #10 Reduced Inequalities
- #4 Quality Education

GREEN CHEMISTRY PRINCIPLES

- **#3** Less Hazardous Chemical Synthesis
- **#5** Solvents
- **#12** Safer Chemistry for Accident Prevention

GC Compass Question 6-7

Compass Tool designed by:

The International Fragrance Association

beyondbenign green chemistry education

Question 6: What type of solvents are used?

Score

--> Mark an "X" to the left of all the solvents used in the process, or mark an "X" to the left of no catalysts responses or "Do not know".

Response:

Most Preferred Solvents	
	acetic anhydride
	anisole
	benzyl alcohol
	ethanol
	ethyl acetate
	carbon dioxide (supercritical)
	cyclohexanone
	ethylene glycol
	isopropanol
	isopropyl acetate
	isopropyl myristate
	methyl acetate
	methylethylketone
	n-butylacetate
	n-butylalcohol
	sulfolane
	t-butylalcohol
	water

Needs Improvement Solvents	
	acetic acid
	acetone
	acetonitrile
	benzyl benzoate
	chlorobenzene
	dimethyl sulfoxide (DMSO)
	dipropylene glycol
	heptane
	methanol
	methyl-tetrahydrofuran
	methyl-cyclohexane
	N,N'-dimethylpropyleneurea (DMPU)
	toluene
	triethyl citrate
	xylenes

Least Preferred Solvents	
	benzene
	carbon disulfide (CS2)
	carbon tetrachloride (CCl4)
	chloroform
	cyclohexane
	1,2-dichloroethane (DCE)
	dichloromethane (DCM)
	diethyl ether
	diisopropyl ether
	dimethoxyethane (DME)
	dimethylacetamide (DMAc)
	dimethylformamide (DMF)
	1,4-dioxane
	formic acid
	hexamethylphosphoramide
	hexane
	methoxy-ethanol
	methyl isobutyl ketone (MIBK)
	methyl tert-butyl ether (MTBE)
	N-methyl-2-pyrrolidone (NMP)
	nitromethane
	pentane
	pyridine
	tetrahydrofuran (THF)
	triethylamine (TEA)

No Solvents	
	No - Solvents are not used in this process

	Do not know

Definitions
A solvent, typically a liquid, is a substance capable of or used for dissolving a substance. Solvents are used in large volumes in chemical reactions and in purification and extraction techniques. Typical solvents used in chemical reactions and processes can pose physical hazards, such as flammability and explosivity, and a wide range of health hazards.

Definitions | Q1_Resources | Q2_Energy Efficiency Use | Q3_Catalyst | Q4_Waste Generation | Q5_Biodegradability | Q6_Solvents | Input Hazard Statements | Q7_Process Safety & Hazards

Check-list of solvents classified based on criteria used in ACS Green Chemistry Institute's Pharmaceutical Roundtable Solvent Selection Guide

https://www.acsgcipr.org/tools-for-innovation-in-chemistry/solvent-tool/

The International Fragrance Association

beyondbenign green chemistry education

the ifra green chemistry compass

Solvents

Enter product or process name:

Product test name

Question 6: What type of solvents are used?

Score: **Needs Improvement**

--> Mark an "X" to the left of all the solvents used in the process, or mark an "X" to the left of no catalysts responses or "Do not know".

Response:

	Most Preferred Solvents
	acetic anhydride
	anisole
	benzyl alcohol
	ethanol
X	ethyl acetate
	carbon dioxide (supercritical)
	cyclohexanone
	ethylene glycol
	isopropanol
	isopropyl acetate
	isopropyl myristate
	methyl acetate
	methylethylketone
	n-butylacetate
	n-butylalcohol
	sulfolane
	t-butylalcohol
X	water

	Needs Improvement Solvents
	acetic acid
X	acetone
	acetonitrile
	benzyl benzoate
	chlorobenzene
	dimethyl sulfoxide (DMSO)
	dipropylene glycol
	heptane
	methanol
	methyl-tetrahydrofuran
	methyl-cyclohexane
	N,N'-dimethylpropyleneurea (DMPU)
	toluene
	triethyl citrate
	xylenes

	Least Preferred Solvents
	benzene
	carbon disulfide (CS2)
	carbon tetrachloride (CCl4)
	chloroform
	cyclohexane
	1,2-dichloroethane (DCE)
	dichloromethane (DCM)
	diethyl ether
	diisopropyl ether
	dimethoxyethane (DME)
	dimethylacetamide (DMAc)
	dimethylformamide (DMF)
	1,4-dioxane
	formic acid
	hexamethylphosphoramide
	hexane
	methoxy-ethanol
	methyl isobutyl ketone (MIBK)
	methyl tert-butyl ether (MTBE)
	N-methyl-2-pyrrolidone (NMP)
	nitromethane
	pentane
	pyridine
	tetrahydrofuran (THF)
	triethylamine (TEA)

	No Solvents
	No - Solvents are not used in this process

	Do not know

Definitions
A solvent, typically a liquid, is a substance capable of or used for dissolving a substance. Solvents are used in large volumes in chemical reactions and in purification and extraction techniques. Typical solvents used in chemical reactions and processes can pose physical hazards,

UN SDGs

- #8 Decent Work & Economic Growth
- #5 Gender Equality
- #10 Reduced Inequalities
- #4 Quality Education

Well-being of employees

GREEN CHEMISTRY PRINCIPLES

- **#3** Less Hazardous Chemical Synthesis
- **#5** Solvents
- **#12** Safer Chemistry for Accident Prevention

GC Compass Question 6-7

Compass Tool designed by:

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Definitions | Q1_Resources | Q2_Energy Efficiency Use | Q3_Catalyst | Q4_Waste Generation | Q5_Biodegradability | Q6_Solvents | Input Hazard Statements | Q7_Process Saf

Solvents are classified in categories to assign score

Worst case scenario is used in scoring

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Questions 7 and 8 rely on a Hazard Score Calculation

Input GHS hazard statements for the final product and all materials used in the process using this tab.

For codes, enter 3 digit number that follows the "H" (ie. 203)

Product Name	Code 1	Code 2	Code 3	Code 4	Code 5	Code 6	Code 7	Code 8	Code 9
My product									

For codes, enter 3 digit number that follows the "H" (ie. 203)

Material Name	Code 1	Code 2	Code 3	Code 4	Code 5	Code 6	Code 7	Code 8	Code 9
Input here									
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+ ≡ Q6_Solvents | **Input Hazard Statements** | Q7_Process Safety & Hazards | Q8_Product Safety & Hazards | Summar

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Question

Input GH

Product Name
My product

Material Name
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Q6_Solve

Sigma-Aldrich.

www.sigmaaldrich.com

SAFETY DATA SHEET

Version 6.10
Revision Date 02/07/2023
Print Date 04/08/2023

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifiers

Product name : Acetaldehyde

Product Number : 402788
Brand : Sigma-Aldrich
Index-No. : 605-003-00-6
CAS-No. : 75-07-0

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich Inc.
3050 SPRUCE ST
ST. LOUIS MO 63103
UNITED STATES

Telephone : +1 314 771-5765
Fax : +1 800 325-5052

1.4 Emergency telephone

Emergency Phone # : 800-424-9300 CHEMTREC (USA) +1-703-527-3887 CHEMTREC (International) 24 Hours/day; 7 Days/week

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)

Flammable liquids (Category 1), H224
Eye irritation (Category 2A), H319
Germ cell mutagenicity (Category 2), H341
Carcinogenicity (Category 1B), H350
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Short-term (acute) aquatic hazard (Category 3), H402

For the full text of the H-Statements mentioned in this Section, see Section 16.

2.2 GHS Label elements, including precautionary statements

Pictogram

Sigma-Aldrich - 402788

Page 1 of 11

The life science business of Merck KGaA, Darmstadt, Germany
operates as MilliporeSigma in the US and Canada

Code 9

Code 9

Hazards Summar

Step 1: Gather the list of chemicals used in the process and the product.

Step 2: Identify all GHS hazard statements associated with each chemical. These can be found on the Safety Data Sheet (SDS) for each chemical.

Input GHS hazard statements for the final product and all materials used in the process using this tab.

For codes, enter 3 digit number that follows the "H" (ie. 203)

Product Name	Code 1	Code 2	Code 3	Code 4	Code 5	Code 6	Code 7	Code 8	Code 9
Product test name	315	402							

For codes, enter 3 digit number that follows the "H" (ie. 203)

Material Name	Code 1	Code 2	Code 3	Code 4	Code 5	Code 6	Code 7	Code 8	Code 9
Reagent 1	300	310	200						
Reagent 2	228	314							
Solvent 1	201	206							
Solvent 2	225	332							
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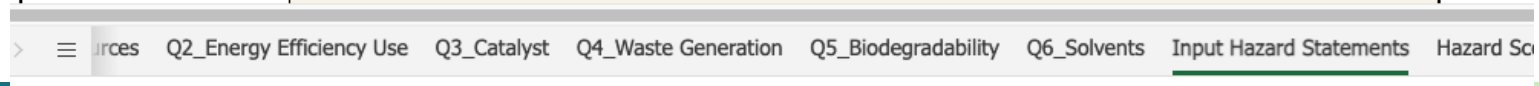

Step 3: List **all** GHS hazard statements associated with the product (only use the 3 digit code following the "H" in each statement). Type each hazard statement into a different column (for example, if the product has two hazard statements, then type the first hazard statement in cell B4 under “Code 1”, then type the second hazard statement in cell C4 under “Code 2”. If your product has more than two hazard statements, then continue to add them in each column.).

Step 5: Input each chemical used in the process into the section under “Material Name”. List the name of the chemical, then input each GHS hazard statement associated with the chemical within each row, using a separate column for each GHS hazard statement. **Be sure to input all hazard statements associated with the material in only the row corresponding to the material. Use a separate row for each material, including all raw materials, reagents, and solvents.**

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Hazard Score: Product test name

The frequency of each Hazard class is determined and an intermediate Hazard Score is given using the Hazard Matrix. Hazard classes of 1 and 2 are considered benign and do not contribute to the Hazard Score

AUTO POPULATED FROM "Input Hazard Statement Tab":

Hazard class	Frequency	partial score
1	0	
2	2	not relevant
3	0	
4	1	1
5	2	2

The Process Hazard Score is the max of the partial score for the whole process:

Process Hazard Score:	2

The Product Hazard Score is the max score given by the conversion classification map:

Product Hazard Score:	2

Hazard Matrix

Frequency	3	4	5
11	5	5	5
10	4	5	5
9	4	5	5
8	4	4	5
7	3	4	5
6	3	4	4
5	3	3	4
4	2	3	3
3	2	2	3
2	1	2	2
1	1	1	1

Hazard category

How Hazard Scores are Calculated

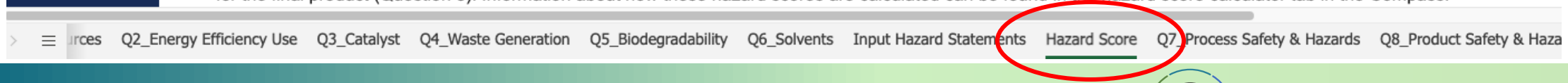
The hazard scores that are calculated within the Green Chemistry Compass include one score for the chemicals used within the process (Question 7) and one score for the final product (Question 8). Information about how these hazard scores are calculated can be found in the hazard score calculator tab in the Compass.

Hazard Scores for Q7 & Q8 are calculated using a GHS hazard statement look-up table and the **Hazard Matrix** on the **Hazard Score tab**

For *transparency* details are included for the calculations are carried out

Calculations are based on:

- Severity of hazard (through a weighting of the GHS hazard scores)
- Frequency of hazard category appearance
- Final Hazard Scores ***use worst case*** of Hazard Class and Frequency table



the ifra green chemistry compass

Process Safety & Hazards

Enter product or process name:

Product test name

Well-being of employees

UN SDGs

- #8 Decent Work & Economic Growth
- #5 Gender Equality
- #10 Reduced Inequalities
- #4 Quality Education

GREEN CHEMISTRY PRINCIPLES

- **#3** Less Hazardous Chemical Synthesis
- **#5** Solvents
- **#12** Safer Chemistry for Accident Prevention

GC Compass Question 6-7

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*--> Your hazard score for **reagents or raw materials** will be autopopulated from the Hazard Score Tab*

Response	Score
2	Most Preferred

Definitions

Physical, health and environmental hazards are defined through the use of the United Nations' Globally Harmonized System of Classification and Labeling of Chemicals (GHS). The GHS Hazard Statements are a set of standardized phrases about the hazards of chemical substances and mixtures. The statements are classified in terms of physical, health or environmental hazards. Physical hazards encompass hazards such as flammability, combustibility, oxidizers, and explosivity (and others). Health hazards include a range of acute and chronic mammalian toxicity from mild to extreme hazards. Environmental hazards include hazards to the environment and ecosystems, including aquatic toxicity and ozone depletion.

Data to gather

GHS Hazard Statements associated with all materials in process, excluding the final product or mixture (this information will also be used to answer Question 8 of the Green Chemistry Compass).

Obtain GHS Hazard Statements from Safety Data Sheets, and by accessing the 2022 IFRA-IOFI Labelling Manual

The response in this Question is autopopulated based on the Input Hazard Statements data tab.

More Information

Utilize the 2022 IFRA-IOFI Labelling Manual to find GHS hazard statements for fragrance and flavoring ingredients. IFRA members with access to the IFRA Library in SharePoint can access and download the Labelling Manual.

IFRA-IOFI Labelling Manual

United Nations' Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

the ifra green chemistry compass

Product Safety & Hazards

Enter product or process name:

Product test name

Product Safety

UN SDGs

#12 Responsible Consumption & Production

GREEN CHEMISTRY PRINCIPLES

#4 Designing Safer Chemicals

GC Compass Question 8

Compass Tool designed by:

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Question 8: Does the *product* pose any physical, health or environmental hazards?

*--> Your hazard score for the **final product** will be autopopulated from the Hazard Score tab*

Response	Score
2	Most Preferred

Definitions
Physical, health and environmental hazards are defined through the use of the United Nations' Globally Harmonized System of Classification and Labeling of Chemicals (GHS). The GHS Hazard Statements are a set of standardized phrases about the hazards of chemical substances and mixtures. The statements are classified in terms of physical, health or environmental hazards. Physical hazards encompass hazards such as flammability, combustibility, oxidizers, and explosivity (and others). Health hazards include a range of acute and chronic mammalian toxicity from mild to extreme hazards. Environmental hazards include hazards to the environment and ecosystems, including aquatic toxicity and ozone depletion.

Data to gather
GHS Hazard Statements associated with the final product or mixture. Obtain GHS Hazard Statements from Safety Data Sheets (SDS), and by accessing the 2022 IFRA-IOFI Labelling Manual (https://ifrafragrance.org/policy/labelling-manual) *The response in this Question is autopopulated based on the Input Hazard Statements data tab.*

More Information
Utilize the 2022 IFRA-IOFI Labelling Manual to find GHS hazard statements for fragrance and flavoring ingredients. IFRA members with access to the IFRA Library in SharePoint can access and download the Labelling Manual. IFRA-IOFI Labelling Manual United Nations' Globally Harmonized System of Classification and Labeling of Chemicals (GHS)

TIP:

IFRA-IOFI GHS Labelling Manual **https://ifrafragrance.org/policy/labelling-manual**

GC Compass: Guiding Questions

the ifra green chemistry compass

Category and Question
Responsible Sourcing
1. Is the product derived or extracted in whole or in part from a renewable, BMB, carbon capture resource?
Environmental footprint & Climate Change
2. a) To what extent is the process for making this product energy intensive? b) Is renewable energy used in whole or in part in the process?
3. a) What type of catalyst, if any, is used in this process? b) What is the mol-recycle number for the catalyst used (if applicable)?
4. How much waste is generated in the process?
5. To what extent is the product or formulation biodegradable?
Well-Being of Employees
6. What type of solvents are used?
7. Do the reagents or raw materials pose any physical, health or environmental hazards?
Product Safety
8. Does the product pose any physical, health or environmental hazards?

The following is a summary of indicators for: **My product**

Category and Question	*Result*	*Explanation*	*Most Preferred (target)*
Responsible Sourcing			
1. Is the product derived or extracted in whole or in part from a renewable, BMB, carbon capture resource?	Needs Improvement	75% product derived or extracted in whole or in part from a renewable, Biomass Balance (BMB) or carbon capture resource. Needs Impovement ratings are based on 50% - 99.9% of product being derived from renewable, Biobased Mass Balance, and/or Carbon Capture resources.	100% of product is derived from renewable, Biobased Mass Balance, and/or Carbon Capture resources.
Environmental footprint & Climate Change			
2. a) To what extent is the process for making this product energy intensive? 2. b) Is renewable energy used in whole or in part i		Temperatures used were between either -10 to 50 degrees Celsius or the pressure was less than 5 ATM.	Temperatures used are between -10 to 50 degrees Celsius or the pressure was less than 5 ATM. OR score will be bumped up a level."
3. a) What type of catalyst, if any, is used in this pro 3. b) What is the mol-recycle number for the catalys	Least Preferred	The reported E-factor is 100. Least preferred ratings are when the E-factor is more than 25	ard catalyst, there is preference for improve the score result by one
4. How much waste is generated in the process?			The Environmental Impact Factor (E-factor), which is the total mass of waste from the process ss than 5.
5. To what extent is the product or formulation biodegradable?		The Environmental Impact Factor (E-factor), which is the total mass of waste from the process divided by the total mass of product, is ideally less than 5.	readily biodegradable. According to the OECD, ual to 60% biodegradable within 28 days
Well-Being of Employees			
6. What type of solvents are used?	Needs Improvement	One or more of the solvents used in the chemical process or formulation process could use improvement. Check the ACS Pharma Rountable Sovent Tool if looking for a replacement.	The most preferred solvents are ones that have low toxicity, low volatility, and low flammability, The list of most preferred solvents include acetic anhydride, anisole, benzyl alcohol, ethanol, ethyl acetate, carbon dioxide (supercritical), cyclohexanone, ethylene glycol, isopropanol, isopropyl acetate, isopropyl myristate, methyl acetate, methyl ethyl ketone, n-butyl acetate, n-butyl alcohol, sulfolane, t-butyl alcohol, water
7. Do the reagents or raw materials pose any physical, health or environmental hazards?	Most Preferred	The Hazard Score of this process, according to the Hazard Score Calculator, is 2. Most perferred ratings are based on Hazard Scores less than 3.	The most preferred score hazard scores are 1-2, indicating low hazards associated with the reagents and raw materials in the process. Explore the ACS Green Chemistry Institute Pharmaceutical Roundtable's Reagent Guides to find alternative reagents for common chemical transformations: https://reagents.acsgcipr.org/
Product Safety			
8. Does the product pose any physical, health or environmental hazards?	Most Preferred	The Hazard Score of this product, according to the Hazard Score Calculator, is 2. Most perferred ratings are based on Hazard Scores less than 3.	The most preferred score hazard scores are 1-2, indicating low hazards associated with the product.

The following is a summary of indicators for: **My product**

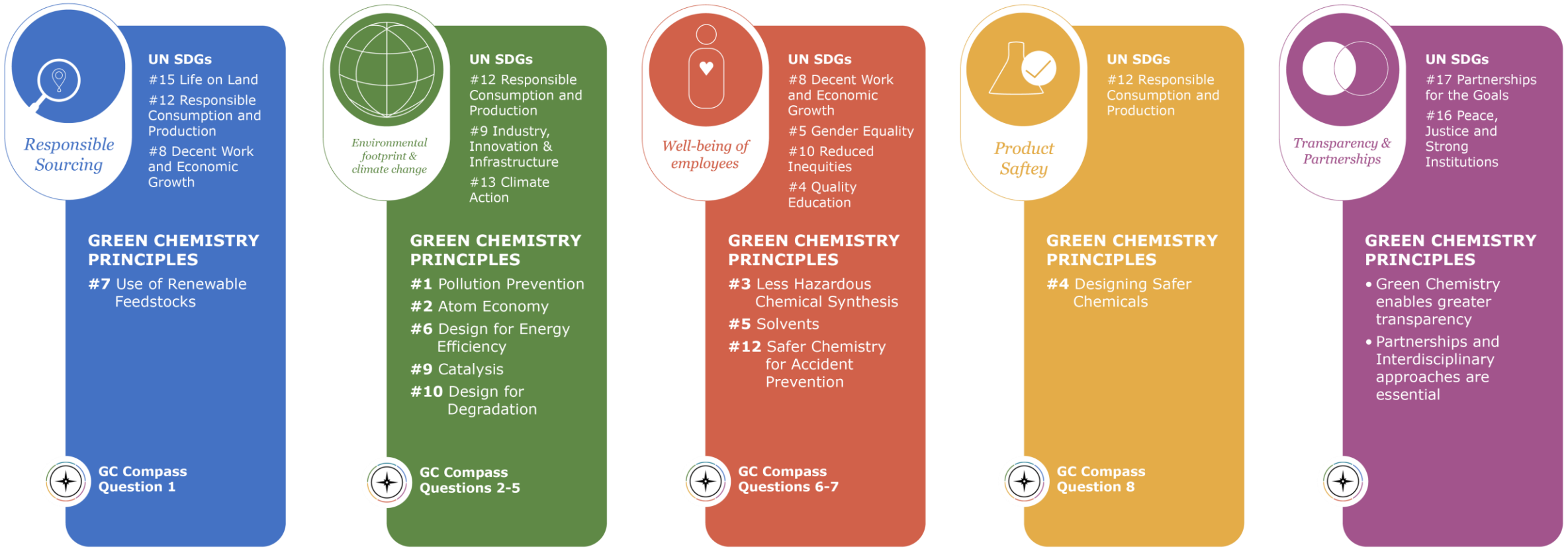
Category and Question	*Result*	*Explanation*	*Most Preferred (target)*
Responsible Sourcing			
1. Is the product derived or extracted in whole or in part from a renewable, BMB, carbon capture resource?	Needs Improvement	75% product derived or extracted in whole or in part from a renewable, Biomass Balance (BMB) or carbon capture resource. Needs Impovement ratings are based on 50% - 99.9% of product being derived from renewable, Biobased Mass Balance, and/or Carbon Capture resources.	100% of product is derived from renewable, Biobased Mass Balance, and/or Carbon Capture resources.
Environmental footprint & Climate Change			
2. a) To what extent is the process for making this product energy intensive? 2. b) Is renewable energy used in whole or in part in the process?	Most Preferred	Temperatures used were between either -10 to 50 degrees Celsius or the pressure was less than 5 ATM. OR The LCA carbon footprint was less than 10 kg CO2/kg material *Note: If 50% or more of the process is renewable energy, the score will be bumped up a level.	Temperatures used are between -10 to 50 degrees Celsius or the pressure was less than 5 ATM. ***OR*** The LCA carbon footprint is less than 10 kg CO2/kg material *Note: If 50% or more of the process is renewable energy, the score will be bumped up a level."
3. a) What type of catalyst, if any, is used in this process? 3. b) What is the mol-recycle number for the catalyst used (if applicable)?	Needs Improvement	Metal-Based Catalysts were used in the reaction. Consider using a biocatalyst or enzyme or increase the TON.	A biocatalyst or enzyme is used. With the exception of high hazard catalyst, there is preference for catalysts with a mol-recycle number 1,000 or greater, which can improve the score result by one level.
4. How much waste is generated in the process?	Least Preferred	The reported E-factor is 100. Least preferred ratings are when the E-factor is more than 25	The Environmental Impact Factor (E-factor), which is the total mass of waste from the process divided by the total mass of product, is ideally less than 5.
5. To what extent is the product or formulation biodegradable?	Most Preferred	This product or formulation is readily biogradeable, which means, according to the OECD,it is greater than or equal to 60% biodegradable within 28 days	Most preferred is a product or formulation that is readily biodegradable. According to the OECD, readily biodegradable means greater than or equal to 60% biodegradable within 28 days
Well-Being of Employees			
6. What type of solvents are used?	Needs Improvement	One or more of the solvents used in the chemical process or formulation process could use improvement. Check the ACS Pharma Rountable Sovent Tool if looking for a replacement.	The most preferred solvents are ones that have low toxicity, low volatility, and low flammability, The list of most preferred solvents include acetic anhydride, anisole, benzyl alcohol, ethanol, ethyl acetate, carbon dioxide (supercritical), cyclohexanone, ethylene glycol, isopropanol, isopropyl acetate, isopropyl myristate, methyl acetate, methyl ethyl ketone, n-butyl acetate, n-butyl alcohol, sulfolane, t-butyl alcohol, water
7. Do the reagents or raw materials pose any physical, health or environmental hazards?	Most Preferred	The Hazard Score of this process, according to the Hazard Score Calculator, is 2. Most perferred ratings are based on Hazard Scores less than 3.	The most preferred score hazard scores are 1-2, indicating low hazards associated with the reagents and raw materials in the process. Explore the ACS Green Chemistry Institute Pharmaceutical Roundtable's Reagent Guides to find alternative reagents for common chemical transformations: https://reagents.acsgcipr.org/
Product Safety			
8. Does the product pose any physical, health or environmental hazards?	Most Preferred	The Hazard Score of this product, according to the Hazard Score Calculator, is 2. Most perferred ratings are based on Hazard Scores less than 3.	The most preferred score hazard scores are 1-2, indicating low hazards associated with the product.

What can the IFRA Green Chemistry Compass help with?

the ifra green chemistry compass

- Target areas for improvement
- Guidance towards best practices
- Where to find additional Green Chemistry Resources (Additional Resources tab included)

The Prioritized Principles of Green Chemistry Aligned to the IFRA Sustainability Charter



Panel and Questions

the ifra green chemistry compass

Amy S. Cannon
Executive Director and Co-Founder, **Beyond Benign**

Amy Perlmutter
Principal, **Perlmutter Associates**

Jonathan Warr
Chair IFRA–IOFI Sustainability Committee, **Takasago International Corporation**

Tony Phan
Naturals Production and Methods Manager, **MANE**

Next Step and Call for Action

Download the IFRA Green Chemistry Compass at https://ifrafragrance.org, under "initiatives"

Complete the Compass Tool for your fragrance ingredients of interest and identify your areas of improvement.

Complete the **consultation feedback survey** afterwards. Think about the following as you fill out:

- Ease of use
- Whether it will help you identify areas where your company can improve its green chemistry efforts and sustainability efforts, and the likelihood of making those changes
- Whether you would use the compass tool again
- After you use the compass tool, can you please complete a short online survey including ways you think the Compass can be improved?

The link to the form is on Intro & Summary page of Compass and on IFRA https://ifrafragrance.org, under "initiatives". For other comments, you can contact info@ifrafragrance.org.

The Global Public Consultation is open until 20 October 2023

Thank You!

- To the Green Chemistry Compass team for their expertise and dedication
- To colleagues at Beyond Benign and Dr John Warner for their guidance
- To the IFRA colleagues for working diligently on delivering objectives
- To all of YOU for your active engagement in the consultation