ОЦЕНОЧНЫЕ МАТЕРИАЛЫ
ПО ДИСЦИПЛИНЕ
Современные аспекты научных исследований

Код модуля	Модуль
1156261	Информационно-аналитические методы в науке и образовании

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1. СТРУКТУРА И ОБЪЕМ ДИСЦИПЛИНЫ Современные аспекты научных исследований

1.	**Объем дисциплины в зачетных единицах**	4	
2.	**Виды аудиторных занятий**	Практические/семинарские занятия	
3.	**Промежуточная аттестация**	Зачет	
4.	**Текущая аттестация**	Контрольная работа	1
		Домашняя работа	1

2. ПЛАНИРУЕМЫЕ РЕЗУЛЬТАТЫ ОБУЧЕНИЯ (ИНДИКАТОРЫ) ПО ДИСЦИПЛИНЕ МОДУЛЯ Современные аспекты научных исследований

Индикатор – это признак / сигнал/ маркер, который показывает, на каком уровне обучающийся должен освоить результаты обучения и их предъявление должно подтвердить факт освоения предметного содержания данной дисциплины, указанного в табл. 1.3 РПМ-РПД.

Таблица 1

Код и наименование компетенции	**Планируемые результаты обучения (индикаторы)**	**Контрольно-оценочные средства для оценивания достижения результата обучения по дисциплине**
1	**2**	**3**
УК-4 -Способен применять современные коммуникативные технологии, в том числе на иностранном(ых) языке(ах), для академического и профессионального взаимодействия	Д-1 - Проявлять доброжелательность и толерантность по отношению к коммуникативным партнерам З-1 - Определять специфику, разновидности, инструменты и возможности современных коммуникативных технологий для академического и профессионального взаимодействия З-2 - Излагать нормы и правила составления устных и письменных текстов для научного и официально-делового общения на родном и иностранном (-ых) языках	Домашняя работа Зачет Контрольная работа Практические/семинарские занятия

	П-1 - Составлять устные и письменные тексты для научного и официально-делового общения на родном и иностранном (-ых) языках в соответствии с правилами и нормами П-2 - Осуществлять поиск вариантов использования инструментов современных коммуникативных технологий для решения проблемных ситуаций академического и профессионального взаимодействия У-1 - Анализировать и оценивать письменные и устные тексты для научного и официально-делового общения на родном и иностранном (-ых) языках на соответствие правилам и нормам и корректировать их У-2 - Воспринимать и анализировать содержание письменных и устных текстов на родном и иностранном (ых) языках с целью определения значимой информации У-3 - Выбирать инструменты современных коммуникативных технологий для эффективного осуществления академического и профессионального взаимодействия	

3. ПРОЦЕДУРЫ КОНТРОЛЯ И ОЦЕНИВАНИЯ РЕЗУЛЬТАТОВ ОБУЧЕНИЯ В РАМКАХ ТЕКУЩЕЙ И ПРОМЕЖУТОЧНОЙ АТТЕСТАЦИИ ПО ДИСЦИПЛИНЕ МОДУЛЯ В БАЛЬНО-РЕЙТИНГОВОЙ СИСТЕМЕ (ТЕХНОЛОГИЧЕСКАЯ КАРТА БРС)

3.1. Процедуры текущей и промежуточной аттестации по дисциплине

1. Лекции: коэффициент значимости совокупных результатов лекционных занятий – не предусмотрено		
Текущая аттестация на лекциях	**Сроки – семестр, учебная неделя**	**Максимальная оценка в баллах**

Весовой коэффициент значимости результатов текущей аттестации по лекциям – не предусмотрено		
Промежуточная аттестация по лекциям – нет **Весовой коэффициент значимости результатов промежуточной аттестации по лекциям – не предусмотрено**		
2. Практические/семинарские занятия: коэффициент значимости совокупных результатов практических/семинарских занятий – 1		
Текущая аттестация на практических/семинарских занятиях	**Сроки – семестр, учебная неделя**	**Максимальная оценка в баллах**
домашняя работа	1,18	50
контрольная работа	1,18	50
Весовой коэффициент значимости результатов текущей аттестации по практическим/семинарским занятиям– 0.4		
Промежуточная аттестация по практическим/семинарским занятиям–зачет **Весовой коэффициент значимости результатов промежуточной аттестации по практическим/семинарским занятиям– 0.6**		
3. Лабораторные занятия: коэффициент значимости совокупных результатов лабораторных занятий –не предусмотрено		
Текущая аттестация на лабораторных занятиях	**Сроки – семестр, учебная неделя**	**Максимальная оценка в баллах**
Весовой коэффициент значимости результатов текущей аттестации по лабораторным занятиям -не предусмотрено		
Промежуточная аттестация по лабораторным занятиям –нет **Весовой коэффициент значимости результатов промежуточной аттестации по лабораторным занятиям – не предусмотрено**		
4. Онлайн-занятия: коэффициент значимости совокупных результатов онлайн-занятий –не предусмотрено		
Текущая аттестация на онлайн-занятиях	**Сроки – семестр, учебная неделя**	**Максимальная оценка в баллах**
Весовой коэффициент значимости результатов текущей аттестации по онлайн-занятиям -не предусмотрено		
Промежуточная аттестация по онлайн-занятиям –нет **Весовой коэффициент значимости результатов промежуточной аттестации по онлайн-занятиям – не предусмотрено**		

3.2. Процедуры текущей и промежуточной аттестации курсовой работы/проекта

Текущая аттестация выполнения курсовой работы/проекта	**Сроки – семестр, учебная неделя**	**Максимальная оценка в баллах**
Весовой коэффициент текущей аттестации выполнения курсовой работы/проекта– не предусмотрено		
Весовой коэффициент промежуточной аттестации выполнения курсовой работы/проекта– защиты – не предусмотрено		

4. КРИТЕРИИ И УРОВНИ ОЦЕНИВАНИЯ РЕЗУЛЬТАТОВ ОБУЧЕНИЯ ПО ДИСЦИПЛИНЕ МОДУЛЯ

4.1. В рамках БРС применяются утвержденные на кафедре/институте критерии (признаки) оценивания достижений студентов по дисциплине модуля (табл. 4) в рамках контрольно-оценочных мероприятий на соответствие указанным в табл.1 результатам обучения (индикаторам).

Таблица 4

Критерии оценивания учебных достижений обучающихся

Результаты обучения	**Критерии оценивания учебных достижений, обучающихся на соответствие результатам обучения/индикаторам**
Знания	Студент демонстрирует знания и понимание в области изучения на уровне указанных индикаторов и необходимые для продолжения обучения и/или выполнения трудовых функций и действий, связанных с профессиональной деятельностью.
Умения	Студент может применять свои знания и понимание в контекстах, представленных в оценочных заданиях, демонстрирует освоение умений на уровне указанных индикаторов и необходимых для продолжения обучения и/или выполнения трудовых функций и действий, связанных с профессиональной деятельностью.
Опыт /владение	Студент демонстрирует опыт в области изучения на уровне указанных индикаторов.
Другие результаты	Студент демонстрирует ответственность в освоении результатов обучения на уровне запланированных индикаторов. Студент способен выносить суждения, делать оценки и формулировать выводы в области изучения. Студент может сообщать преподавателю и коллегам своего уровня собственное понимание и умения в области изучения.

4.2 Для оценивания уровня выполнения критериев (уровня достижений обучающихся при проведении контрольно-оценочных мероприятий по дисциплине модуля) используется универсальная шкала (табл. 5).

Таблица 5

Шкала оценивания достижения результатов обучения (индикаторов) по уровням

<table>
<tr><th colspan="5">Характеристика уровней достижения результатов обучения (индикаторов)</th></tr>
<tr><th rowspan="2">№ п/п</th><th rowspan="2">Содержание уровня выполнения критерия оценивания результатов обучения (выполненное оценочное задание)</th><th colspan="3">Шкала оценивания</th></tr>
<tr><th colspan="2">Традиционная характеристика уровня</th><th>Качественная характеристика уровня</th></tr>
<tr><td>1.</td><td>Результаты обучения (индикаторы) достигнуты в полном объеме, замечаний нет</td><td>Отлично (80-100 баллов)</td><td>Зачтено</td><td>Высокий (В)</td></tr>
</table>

2.	Результаты обучения (индикаторы) в целом достигнуты, имеются замечания, которые не требуют обязательного устранения	Хорошо (60-79 баллов)		Средний (С)
3.	Результаты обучения (индикаторы) достигнуты не в полной мере, есть замечания	Удовлетворительно (40-59 баллов)		Пороговый (П)
4.	Освоение результатов обучения не соответствует индикаторам, имеются существенные ошибки и замечания, требуется доработка	Неудовлетворительно (менее 40 баллов)	Не зачтено	Недостаточный (Н)
5.	Результат обучения не достигнут, задание не выполнено	Недостаточно свидетельств для оценивания		Нет результата

5. СОДЕРЖАНИЕ КОНТРОЛЬНО-ОЦЕНОЧНЫХ МЕРОПРИЯТИЙ ПО ДИСЦИПЛИНЕ МОДУЛЯ

5.1. Описание аудиторных контрольно-оценочных мероприятий по дисциплине модуля

5.1.1. Практические/семинарские занятия

Примерный перечень тем

1. Introduction
2. Getting to know each other
3. More contacts
4. Translation of technical texts
5. Technical papers discussion
6. Making presentations
7. Participating in a conference
8. Participating in negotiations
9. Revising grammar
10. Paper writing

Примерные задания

Примерные задания

Before you read

Discuss these questions with your partner.

- Can you name any famous chemists?
- What are they famous for?
- Where do chemists work?
- What equipment do they use?

A Vocabulary

Complete the sentences below with words from the box.

- conservation of mass
- combustion
- accurate
- alchemists

 matter
 quantity
 breakthrough
 properties

1. It is a fact that substances cannot change their ………………..
2. …………….. means that no matter how a substance is changed, what it is made up of will always stay the same.
3. When scientists make a ……………. they succeed after trying very hard.
4. Without oxygen there cannot be ……………. - things cannot burn.
5. ……………………. is what physical objects are made of.
6. All classifications in chemistry need to be ……………………….
7. ……………………….. believed that they could turn iron into gold.
8. Mendeleev's table classifies the elements found in nature according to their ……………..

Reading 1.

Chemistry.

An introduction

Chemistry is often said to be the central science, as it connects all other sciences. While mathematicians calculate the world, physicists explain it and biologists say what lives in it, chemistry looks at everything in the world and explains how it is made and what it can do.

Chemistry began with fire. Burning changes things and ancient man must have wondered what happened to the wood he burnt. It was by burning things that ancient man discovered iron and glass, combining different substances in the fire and seeing how they combined. Once gold was found, the false science of alchemy was born. People believed they could change ordinary metals like iron into gold. Though the idea was wrong, the alchemists discovered many of the chemical processes that are in use today.

The origin of modern chemistry comes from the work of Antoine Lavoisier, an 18th century Frenchman who was executed in 1794 during the French Revolution. He formulated the idea of the conservation of mass: that is, even though substances can be changed, their quantity of mass remains the same always. Although Lavoisier was the first to publish his ideas, in Russia, Mikhail Vasilyevich Lomonosov had reached the same conclusions some years earlier. Both men were interested in the nature of combustion - what happens when things burn - and this was the first breakthrough in our understanding of chemistry.

The second great development in chemistry came later and concerned the nature of matter itself: how it was made up and what its parts were. In the early part of the 19t h century, the British scientist, John Dalton stated that all matter was made up of atoms of different elements and that these could not be broken down into smaller parts. We know now that atoms exist and that they do have parts which can be broken down, but at the time his ideas divided chemists into those who accepted his ideas and those who did not. There was a whole century of research to be done before the work of Marie Curie on radioactivity and of Ernest Rutherford and Niels Bohr on atomic structure finally proved that Dalton was correct after all.

Even while chemists were divided on atomism, it became necessary for someone to make sense of the growing list of elements that were being discovered. That someone was Dmitri Mendeleev. He took Dalton's theory of atomism and arranged the elements by their atomic weight and by their chemical properties. So accurate was his classification of the elements, that he was able to predict the properties of undiscovered ones to fill the gaps in the table. Mendeleev's table is one of the most useful and important generalisations of chemistry and of all science.

These three developments give us the definition of chemistry. It is the science of the composition, structure and properties of substances and how they can be transformed.

B Comprehension

Give a title to each paragraph. Read the text again and complete the summary. Use words from the text.

Chemistry is the science which (1) ………………… all other sciences. Through chemistry, we can study how things are made and what they can do. Alchemists discovered a lot of chemical (2) ………………… before chemistry developed properly. There are three main areas of study in modern chemistry. The first is about how (3) ……………….. change when something happens to them. The second is about how things are made, and looks at the atomic (4) ………………… of elements. The third is to look at the (5)……………… of elements.

Before you listen

Discuss these questions with your partner.

- What is the difference between an element and a compound?
- What is the difference between a liquid, a solid and a gas? Name as many as you can.

C Listening

Listen to a chemist talking about chemical processes. Then listen again and complete these notes. Choose from the words in the box. Ther e are mor e words in the box than you need.

• solid
• elements
• liquid
• bond
• materials
• compound
• process
• form
• atoms
• gas

For example, two (1) ………………. : hydrogen and oxygen. Hydrogen has the atomic number (2) ………….. and oxygen (3) ………………….. .Two molecules of hydrogen and one of oxygen = one (4) ………………. . Water can change its (5) …………………. but is still H2O. Some chemical processes appear complicated as they have different (6) …………………. bonding in different quantities.

Before you read

Discuss these questions with your partner.

- What do chemists produce?
- Why do doctors need chemists?
- Do you think chemists can do anything to help pollution?

D Vocabulary

Match these words and phrases with their definitions.

1. preservation A to take out of
2. oil refining B watch carefully to give taste D process that keeps
3. waste C something added to give taste

4. flavouring D process that keeps something in the same condition
5. meet the standard E very small strands
6. monitor F produce
7. cure G making oil purer
8. manufacture H unwanted part of production process
9. fibre I be of the right level
10. extract J make healthy

B Reading 2

Chemistry today

Careers in chemistry: what can you do with a degree in Chemistry?

This leaflet has been written to help you decide about your future. You have studied Chemistry at university and have decided that you want to continue working in the science. What career opportunities are available? There are two main areas where your knowledge of chemistry will be called upon: medicine and industry.

Medicine

Many chemists work in medicine. In fact, it is probable that our hospitals and doctors could not operate without the support they get from chemists. Chemists are the people who carry out the research and develop new medicines. All over the country, chemists are working on new cures for diseases. There is always more work to be done on antibiotics. Bacteria develop resistance to these drugs and biochemists need to be constantly testing how well these medicines are working as well as looking at new antibiotics to replace the old ones. There are many illnesses which have no cure at the present time and a great deal of research is going on, looking for new and better treatments for cancer, HIV/AIDS and malaria.

There are career opportunities within hospitals, too. Doctors need the support of chemists analysing samples from patients, conducting tests and measuring how well patients are responding to treatment. One quickly developing area is in the testing and recording of DNA samples.

Industry

Chemists work in the food industry, creating chemical flavourings and preservatives to improve the quality of what we eat or to help keep it fresher for longer. Other people work in quality 3 2 Macmilla n Guid e t o Scienc e Unit 10 Chemistry control, sampling and testing the food products to make sure that they meet the standards we expect them to have. In recent years, the European Union has revised its standards for quality and health in all food products sold in the EU, including both those made there and imported. Chemists have their part to play in monitoring these products as well as in developing new methods of meeting these standards.

Another very important industry that our knowledge of chemistry has created is the oil refining industry. Oil is taken out of the ground and put through a chemical process which turns it into many different products. From oil, we can make not only petrol, but also plastics, synthetic fibres, paint and gases for fuel and other uses. A major concern in the industry today is the pollution resulting from these processes. Industries are trying to reduce the impact of this by wasting less and by extracting more from the waste products of the manufacturing process. Chemists are working to filter harmful waste, preventing it from going into the atmosphere.

Almost all other industries depend in some way on the work of chemists. Chemistry has given us a huge range of plastics and colourings. In fact, there is a chemical process involved in everything we make. The whole manufacturing process needs to be designed, managed and tested for safety by chemists.

Other choices

Career opportunities for chemists also exist in journalism, the law and education.

E Comprehension

Read the text and answer the questions in your own words.

1. How do chemists help to treat and cure diseases?
2. How can chemists support doctors working in hospitals?
3. What do chemists do to make sure we have good quality food?
4. What part do chemists play in the production of plastics?
5. How are chemists working to reduce pollution?

Before you listen

Discuss this question with your partner.

- How is life today different from life last century when medical drugs weren't available?

F Listening

Listen to a chemist talking about his job. Then answer the questions.

1. What kind of a business does he work for?
2. How long does it take to test a new compound?
3. Where does he spend his time working?
4. Can he usually predict the result of his experiments?
5. What percentage of his experiments fail?

G Speaking

Discuss these questions with your partner.

- What are the main branches of modern chemistry?
- Do you know any recent inventions in the field of chemistry?
- Would you like to work as a chemist? Why / Why not?
- Would you say it was one of the best jobs available? Give your reasons.

Task

Working in a group, discuss the opportunities for chemists in today's economy. Use the information in tex t 2 and any ideas of your own.

Talk about:

- where chemists work
- what they do
- what they are responsible for

First complete these notes. Use them in your discussion.

Career opportunities working in chemistry

Main work areas:

Medicine

Research, development and testing: …………….

Offer support to doctors: …………………. sampling and recording (esp. DNA)

Industry

Developing new products: food ……………………

Designing and organising chemical processes for industry

Monitoring and improving processes (food production, pollution control)

Conclusion
Remember to:
• read the text again
• add any ideas of your own
• explain the general idea and then give details
• allow everybody to speak
Speaking tips
• You could choose a secretary to keep notes of what you discuss and inform you of any points you forget.
• Make sure everyone is given plenty of opportunity to speak. The secretary could check this too.
H Writing
Write a short essay with the title:'Wha t is chemistry and what does it study?'
Read tex t I again and use these notes to write four paragraphs.
PARAGRAPH 1
Introduction (how the essay is organised)
• What do chemists do?
• What are they interested in?
• What are the main areas of the science?
Vocabulary: To begin with, chemists, chemistry, etc
PARAGRAPH 2
Chemistry studies matter, how matter is made, what happens when matter changes
Vocabulary: moreover, matter, materials, structure, transform
PARAGRAPH 3
three important areas in chemistry:
• transformation - how chemical changes occur
• atomic structure - how materials are made and how they are different from each other
• elements of matter - what they are and what their properties are, classified by Mendeleev
Vocabulary: furthermore, atom, elements, properties
PARAGRAPH 4
Conclusion (summarise ideas)
Vocabulary: finally, to sum up, generally, science

LMS-платформа − не предусмотрена

5.2. Описание внеаудиторных контрольно-оценочных мероприятий и средств текущего контроля по дисциплине модуля

Разноуровневое (дифференцированное) обучение.

Базовый

5.2.1. Контрольная работа

Примерный перечень тем
1. Перевод научно-популярных и научных текстов с английского языка на русский
2. Перевод научно-популярных и научных текстов с русского языка на английский

Примерные задания

Примерные задания

Translate into Russian

I variant

1. The region surrounding a magnet, in which appreciable magnetic forces exist, is referred to as the magnetic field.

2. The use of metals is affected by the available ore resources, the cost of extraction and refining, and the way in which they can be employed to practical advantage.

3. Almost all materials are affected to some extent when placed in a strong magnetic field.

4. In order to determine whether a given compound is organic it is frequently sufficient merely to heat it.

5. It is still uncertain whether the variations in energy of electrons can be wholly accounted for by energy losses during their passage through the material, or whether their initial energies differ.

6. To summarize the findings of this tremendous work would require many pages.

7. The general problem to be solved is to find the current density distribution across the radius as a function of time.

8. Cosmic rays have been observed to end their paths from outer space in violent nuclear collisions, the latter being known to take place high above the earth.

9. The methods of testing are selected in accordance with the purpose for which the given material is to be used.

10. The larger the number of different elementary operations, the more complicated the design of the machine and the greater the amount of the equipment needed.

11. Exact knowledge of the state of the system at one time enables one to determine its behavior in the future.

12. Different forms of magnetic circuits can be employed, depending on material used, results desired, cost and other factors.

13. As radio waves travel away from their point of origin, they become attenuated as a result of spreading out due to energy being lost in travel.

14. While discussing electrical conductivity it is of interest to refer to the electronic structures of silver and copper.

15. It has to be admitted that advance and discovery is accompanied by a certain loss.

Translate into English:

I variant

1 Химия - это самая главная наука, т. к. связывает между собой все другие науки.

2 Алхимики открыли многие химические процессы, пытаясь превратить обыкновенные металлы в золото.

3 Начало современной химии положили работы французского учёного XVIII века Антуана Лавуазье, который сформулировал закон сохранения массы.

4 Существует много отраслей науки и промышленности, где востребовано знание химии.

5 В области медицины химики работают над новыми лекарствами от различных болезней, создают новые антибиотики и проводят другие важные исследования.

6 Химики работают в пищевой промышленности, например, они контролируют качество продуктов, которое должно отвечать определённым стандартам.

7 Термин “атом” имеет греческое происхождение и означает мельчайшую частицу химического элемента.

8 Первую научную гипотезу атомарного строения материи выдвинул британский учёный Джон Дальтон.

9 Дальтон рассматривал атом как частицу, которая может объединяться с атомами других химических элементов и образовывать химические соединения.

10 Закон сохранения массы гласит, что масса всех веществ, вступивших в химическую реакцию, равна массе всех продуктов реакции.

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5.2.2. Домашняя работа

Примерный перечень тем

1. Выполнить перевод научной литературы (статьи) по специальности в общем объеме 50,000 печатных знаков

2. Выполнение презентации: темы 1. химия, 2. ученые, 3. экология, 4. научный доклад (по теме магистерской работы)

Примерные задания

Примерные задания

Как пример отрывок из статьи, взятой с сайта Elsevier:

Green and sustainable chemistry – The case for a systems-based, interdisciplinary approach

David J.C. Constable1,

SUMMARY

Although the concepts underpinning green chemistry have evolved over the past 30 years, the practice of green chemistry must move beyond the environmental and human health-related roots of green chemistry towards a more systems-based, life cycle-informed, and interdisciplinary practice of chemistry. To make a transition from green to sustainable chemistry, one must learn to think at a systems level; otherwise, green chemistry-inspired solutions are unlikely to be sustainable. This perspective provides a brief description of why the current situation needs to change and is followed by how life cycle thinking helps chemists avoid significant systems-level impacts. The transition from batch to continuous flow processing and novel approaches to isolation and purification provide a case for interdisciplinary collaboration. Finally, an example of end-of-useful-life considerations makes the case that systems and life cycle thinking from an interdisciplinary perspective needs to inform the design of new chemical entities and their associated processes.

INTRODUCTION

For much of the past 30 years, green chemistry has been largely identified with two central ideas: the reduction or elimination of toxic substances and pollution prevention (U.S. E.P.A, 2021). Much of what has been written and spoken about green chemistry is rooted in environmentalism, environmental policies, and governmental regulations promulgated since the 1980’s. For the period between 1995 and about 2010, proponents of green chemistry struggled with being seen as a legitimate part of chemistry within the traditional chemistry community for many reasons, but three stand out. The first is that green chemistry was seen as being environmentally related, applied, and not innovative. The second is that because of the association with the environment, it was seen as more of an environmental movement and not science (Breyman and Woodhouse, 2005). The third is that many in industry felt that they had been doing the pollution prevention aspects incorporated in green chemistry for many years, but especially through the 1970's and 1980's (Murphy, 2018, 2020).

When considering chemistry research from a green chemistry perspective, another challenge to chemistry researchers in traditional chemistry disciplines is the necessity of drawing from multiple scientific and engineering disciplines to not only understand the underlying chemical and physical phenomena, but to better understand why the current approaches to chemistry need to change (Constable, 2017; Whitesides, 2015; Matlin, et al., 2016). Similar to non-traditional chemistry fields like biochemistry and nanochemistry, to be successful in green chemistry-related research, one must draw from many different disciplines.

I would also say that this need for an interdisciplinary approach is amplified as one moves from a singular focus on green chemistry to one that incorporates a consideration of two related ideas, sustainability and sustainable development. For the purposes of this article and the current argument, sustainability will be confined to thinking about environmental sustainability; i.e., actions and behaviors one must take to ensure that the chemistry being practiced is not creating current or generational environmental impacts. It should be understood that the use of the term sustainability typically envisions a ''triple bottom line'' approach that includes a concurrent consideration of environmental, societal and economic impacts (Elkington, 2018), but such considerations are generally not embraced by the chemistry community which fails to see the point or necessity of connecting molecular-scale chemical phenomena to macro-scale impacts. The most frequent definition of sustainable development is from ''Our Common Future,'' also known as the Brundtland Report (World Commission on Environment and Development, 1987), and is ''Sustainable Development is development that meets the needs of the present without compromising the needs of future generations to meet their own needs.'' The practice of chemistry is inherently rooted in the present and by design, on a time scale of less than a second to perhaps hours. In addition, for many academic

research chemists and the institutions that fund them, ''real'' chemistry is decoupled from any notion of application or development; it is science to advance the science of chemistry, not to fulfill the needs of human society.

Therefore, to make a transition from green chemistry to sustainable chemistry, one must learn to think at a sys-

tems level, otherwise green chemistry-inspired solutions are unlikely to be sustainable. Although systems thinking is routinely taught in a variety of scientific and engineering disciplines, it has only recently been introduced to chemistry educators as something that needs to be included in chemistry education (Mahaffy, et al.,2018, 2019). There are a variety of definitions for systems thinking in science, engineering, social, and organizational contexts, and an agreed, or authoritative, or standard definition of a system or systems thinking for the chemistry context has yet to be established (York and Orgill, 2020). In essence, it is best to understand a system

as being a logical construct or model of real-world phenomena that contains a collection of components or parts. These components are coherently organized and interconnected in patterns or in a structured and usually hierarchical manner to produce a characteristic set of behaviors, often classified as the system's ''function'' or ''purpose,'' or to answer a question related to systems outputs and outcomes. The study of changes in the state of a system over time and space are included in what is known as systems dynamics. Although it is beyond the scope of this article to discuss the details of systems thinking, one should appreciate that systems are everywhere, of different scales, and usually a part of a system of systems. This connectedness of system components with and between other systems is generally not explicitly seen as being a part of chemistry and that is one reason why systems thinking is critical to understanding how to practice green and sustainable chemistry.

Systems thinking also helps one to manage the complexity that is inherent to sustainability and the implementation of green and sustainable chemistry (Constable, et al., 2019). Figure 1 shows a systems-level view of chemical evaluation. An important point to be made about thinking in systems within the chemistry context is that this should be accompanied by life cycle thinking, i.e., a consideration of environmental safety and health hazards and risks associated with the constituents of a material or product. Chemical trees may be used to visualize the gate-to-gate manufacturing processes and an inventory made of the associated inputs, outputs, and emissions for each step leading to the constituent parts of a material or product, from raw material extraction to a factory gate. Once the product is made, life cycle thinking considers a similar input/output inventory for the distribution, use and end-of-life phases of the product. In recent years, the end-of-life phase is increasingly incorporating a consideration of recycling/reuse and impacts related to waste management to advance the circular economy (Kirchherr et al., 2017). In a full life cycle inventory/assessment, there is a detailed, quantitative accounting for all the impacts and these impacts are combined into discrete categories (e.g., greenhouse gas equivalents, etc.) where they may be assessed for their cumulative impacts for the material or product life cycle. As is hopefully evident, life cycle thinking requires one to think of the material, process, or product in terms of a system of systems where the output of the life cycle is limited to the cumulative environmental impacts associated with the material or product. As important as life cycle thinking is, it should be understood that systems thinking is a broader, more comprehensive and holistic approach to considering material, process, or product benefits and impacts.

Life cycle and systems thinking should be practiced as complementary and synergistic lines of thinking. Merely formalizing a benchtop chemical reaction, or industrial chemical process, as a system, without consideration of a molecule's system and life cycle impacts defeats the purpose of systems thinking for green chemistry. Systems thinking also requires an interdisciplinary approach if one is to understand sustainability drivers and to correctly define the system, draw meaningful boundaries, recognize causal and feedback loops, and see the inter-system interactions that are common to considerations of sustainability. Chemistry impacts, and is impacted by, human/social systems, economic systems, and environmental systems. Figure 2 contains some, but by no means all, of the professions and skills that might contribute to systems thinking in chemistry and the system-of-systems supporting chemistry. Sustainable chemistry, to be successful, requires one to develop disciplinary skills outside of chemistry, and partner routinely with other scientists, engineers, businesses, and many other non-science-based professions. If a chemist does not do this, they will never arrive at a sustainable solution to chemical problems. The remainder of this article highlights a few key considerations and the interdisciplinary needs associated with selected aspects of making molecules from a mostly bioactive molecule perspective e.g., pharmaceuticals or crop protection agents. Green chemistry in the minds of many has been popularized as a limited number of easily accomplished practices a chemist needs to do to make a molecule green, greener, or more sustainable. If that was truly the case, there would be less of a reason to still be discussing the rationale for practicing and implementing green, greener, and now, more sustainable chemistry. What follows are several illustrations to show chemists need to employ systems thinking. The first is a high-level overview of some sustainability pitfalls of modern catalysis and what is needed to make it more sustainable. The second illustration is the underlying need to move as many batch chemical operations currently done in

batch to a flow regime as warranted. The third illustration concerns the isolation, work-up and purification of biologically active molecules and the general need to reduce the impacts associated with this common operation. Finally, the case is made for chemists to develop a greater understanding of the life cycle impacts associated with the choices chemists make at the bench, pilot and process level, and work collaboratively with other scientists and engineers to make chemistry greener and more sustainable while addressing the world's grand challenges of sustainability (National Research Council, 2006).

Требования к статьям для перевода:

1. Статья должна соответствовать направлению специальности
2. Текст должен быть написан зарубежными авторами
3. Не допускается перевод статьи из ненадежных источников типа википедия
4. При сдаче работы допускается пользоваться словарем, сделанным при подготовке перевода статьи дома.

Критерии оценивания:

Оценка	Критерии
50 баллов (80-100 баллов)	Перевод выполнен в полном объёме, стилистически грамотно с точным подбором адекватных лексических (терминологических) средств перевода научно-технической литературы
40 баллов (60-79 баллов)	Перевод выполнен в полном объёме, но с небольшими стилистическими и лексико-грамматическими неточностями.
30 баллов (45-59 баллов)	Перевод выполнен не в полном объёме и со стилистическими и лексико-грамматическими неточностями, нарушающими адекватное восприятие текста.
15 баллов (30-44 баллов)	Перевод выполнен не в полном объёме и с большими стилистическими и лексико-грамматическими неточностями, ведущими к искажению понимания содержания иноязычного текста.
0-7 баллов (0-29 баллов)	Перевод выполнен фрагментарно.

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5.3. Описание контрольно-оценочных мероприятий промежуточного контроля по дисциплине модуля

5.3.1. Зачет

Список примерных вопросов

1. Educational background: the university, faculty, specialty, field
2. Work, professional duties and responsibilities
3. The reasons for applying for master course
4. The scientific adviser, the sphere of his/her research
5. One's special interests, what they are caused by (the problem/problems, the achievements in this field, the remaining problem, possible ways to solve it, perspectives)
6. Possible results of one's scientific investigation/research
7. Experiments and tests conducted and to be conducted (equipment, facilities to be used, processes to be studied)
8. The achievements made (both theoretical and practical), results already obtained, methods used
9. Environmental concerns
10. The proportion of theoretical and practical work

LMS-платформа − не предусмотрена

5.4 Содержание контрольно-оценочных мероприятий по направлениям воспитательной деятельности

Направления воспитательной деятельности сопрягаются со всеми результатами обучения компетенций по образовательной программе, их освоение обеспечивается содержанием всех дисциплин модулей.