Федеральное государственное бюджетное
образовательное учреждение высшего образования
«Саратовский государственный медицинский университет имени В. И. Разумовского»
Министерства здравоохранения Российской Федерации

ПРИНЯТА

Ученым советом лечебного факультета
и факультета клинической психологии
протокол от 18.04.2023 № 3
Председатель _____ А.В. Романовская

УТВЕРЖДАЮ

Декан фармацевтического факультета
_____ Н.А. Дурнова
«18» 04 2023 г.

РАБОЧАЯ ПРОГРАММА УЧЕБНОЙ ДИСЦИПЛИНЫ

Иностранный язык (английский язык)

Специальность (направление подготовки)	33.05.01 (Фармация)
Форма обучения	Очная
Срок освоения ОПОП	5 лет
Кафедра	Иностранных языков

ОДОБРЕНА

на заседании учебно-методической конференции кафедры от 10.04.2023 № 4

Заведующий кафедрой _____ Е.В. Чернышкова

СОГЛАСОВАНА

Заместитель директора департамента организации образовательной деятельности
_____ Д.Ю. Нечухраная
«12» 04 2023 г.

СОДЕРЖАНИЕ

Рабочая программа учебной дисциплины «Иностранный язык» разработана на основании учебного плана по специальности 35.05.01 Фармация, утвержденного Ученым Советом Университета, протокол от «28» февраля 2023г., № 2; в соответствии с ФГОС ВО по специальности 35.05.01 Фармация, утвержденным приказом Министерства образования и науки Российской Федерации «27» марта 2018 г. № 219.

1. ЦЕЛЬ И ЗАДАЧИ ОСВОЕНИЯ ДИСЦИПЛИНЫ

Цель: овладение будущими медиками основами иноязычной компетенции, необходимой для профессиональной межкультурной коммуникации, и формирование у них практических навыков и умений владения устными и письменными формами общения на иностранном языке для использования его в качестве средства информационной деятельности и дальнейшего самообразования.

Иноязычная компетенция как основа профессионального иноязычного общения включает:

- ***языковую и речевую компетенции***, позволяющие использовать иностранный язык для получения профессионально значимой информации, используя разные виды чтения;
- ***коммуникативную компетенцию***, позволяющую участвовать в устном и письменном профессиональном общении на иностранном языке;
- ***социокультурную компетенцию,*** обеспечивающую эффективное участие в общении с представителями других культур.

Задачи:

1) - ознакомление студентов с особенностями научного стиля медицинской литературы; основными видами словарно-справочной литературы и правилами работы с ними;
2) - приобретение студентами знаний в области лексики и грамматики изучаемого языка (применительно к специфике подъязыка медицины)
3) - обучение студентов чтению специальных текстов на иностранном языке (разные виды чтения применительно к разным целям) и умению извлекать и фиксировать полученную из иноязычного текста информацию в форме аннотации, реферата (устно и письменно);
4) - формирование навыков общения на иностранном языке (в рамках тематики, связанной с медицинским образованием в России и в стране изучаемого языка;
5) - обучение студентов основным принципам самостоятельной работы с оригинальной литературой.

2. ПЕРЕЧЕНЬ ПЛАНИРУЕМЫХ РЕЗУЛЬТАТОВ ОБУЧЕНИЯ

Формируемые в процессе изучения учебной дисциплины компетенции

Наименование категории (группы) компетенций	**Код и наименование компетенции (или ее части)**
1	2
Коммуникация	**УК-4** Способен применять современные коммуникативные технологии, в том числе на иностранном(ых) языке(ах), для академического и профессионального взаимодействия
ИД$_{УК-4.}$-1 Устанавливает и развивает профессиональные контакты в соответствии с потребностями совместной деятельности, включая обмен информацией и выработку единой стратегии взаимодействия ИД$_{УК-4.}$-2 Составляет, переводит с иностранного языка на государственный язык РФ и с государственного языка РФ на иностранный, а также редактирует различные академические тексты (рефераты, эссе, обзоры, статьи и т.д.), в том числе на иностранном языке ИД$_{УК-4.}$-3 Представляет результаты академической и профессиональной деятельности на различных публичных мероприятиях, включая международные, выбирая наиболее подходящий формат ИД$_{УК-4.}$-4 Аргументированно и конструктивно отстаивает свои позиции и идеи в академических и профессиональных дискуссиях на государственном языке РФ и иностранном языке ИД$_{УК-4.}$-5 Выбирает стиль общения на государственном языке РФ и иностранном языке в зависимости от цели и условий партнерства; адаптирует речь, стиль общения и язык жестов к ситуациям взаимодействия	

3. МЕСТО УЧЕБНОЙ ДИСЦИПЛИНЫ В СТРУКТУРЕ ОБРАЗОВАТЕЛЬНОЙ ПРОГРАММЫ

Учебная дисциплина «Иностранный язык» относится к блоку Б1.Б.10 базовой части учебного плана по специальности 33.05.01 Фармация.

Материал дисциплины опирается на ранее приобретенные студентами знания по иностранному языку, сформированные при получении среднего (полного) общего или среднего профессионального образования.

4.ТРУДОЕМКОСТЬ УЧЕБНОЙ ДИСЦИПЛИНЫ И ВИДЫ КОНТАКТНОЙ РАБОТЫ

Вид работы	**Всего часов**	**Кол-во часов в семестре**	
		№ 1	**№ 2**
1	2	3	4
Контактная работа (всего), в том числе:	**116**	58	58
Аудиторная работа	**116**	58	58
Лекции (Л)	-	-	-
Практические занятия (ПЗ),	**116**	58	58
Семинары (С)	-	-	-
Лабораторные работы (ЛР)	-	-	-
Внеаудиторная работа	-	-	-
Самостоятельная работа обучающегося (СРО)	**100**	68	32

Вид промежуточной аттестации	зачет (З)	-	-	-
	экзамен (Э)	**36**	-	36
ИТОГО: Общая трудоемкость	час.	**252**	72	180
	ЗЕТ	**7**	3,5	3,5

5.СТРУКТУРА И СОДЕРЖАНИЕ УЧЕБНОЙ ДИСЦИПЛИНЫ

5.1 Разделы учебной дисциплины и компетенции, которые должны быть освоены при их изучении

№ п/п	Индекс компетенции	Наименование раздела учебной дисциплины	Содержание раздела
1	2	3	4
1	УК4	Раздел 1 **Медицинское образование: обучение основам устного профессионального общения**	Правила чтения, произношения и интонирования. Правила словообразования и основы морфологии. Лексика по теме (продуктивно). Порядок слов в повествовательном предложении; спряжение глаголов to be, to have в Present, Past, Future Indefinite; времена группы Indefinite Active. Число существительных; артикли; местоимения (личные, притяжательные), числительные; система времен глагола (личные формы глагола). Способы передачи падежных отношений; предлоги; оборот there + be; безличные предложения, степени сравнения имен прилагательных, указательные и неопределенные местоимения. Общий и специальный вопросы; образование Present Participle; времена группы Continuous Active, модальные глаголы can, may, must. Указательные и неопределенные местоимения, степени сравнения прилагательных и наречий.

2	УК4	Раздел 2 **Наука о жизни: обучение чтению специальной литературы**	Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии. Лексика по теме (продуктивно). Времена группы Indefinite Passive; образование Past Participle; согласование времен; парные союзы; согласование времен. Времена группы Perfect Active; неопределенно-личные предложения. Система времен глагола (личные и неличные формы глагола); страдательный залог. Инфинитив, его функции; причастия I,II, страдательный залог; заменители существительных. Синтаксис. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.
3	УК4	Раздел 3 **История медицины. Выдающиеся медики: обучение основам устного профессионального общения**	Лексика по теме (продуктивно). Грамматические конструкции, характерные для устной формы профессионального общения.
4	УК4	Раздел 4 **Аптека: обучение основам устного профессионального общения**	Лексика по теме (продуктивно). Грамматические конструкции, характерные для устной формы профессионального общения.
5	УК4	Раздел 5 **Лекарственные средства: обучение чтению специальной литературы; обучение аннотированию лекарственных препаратов**	Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии. Лексика по теме (продуктивно). Синтаксис. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.
6	УК4	Раздел 6 **Всемирная организация здравоохранения. Сотрудничество в области медицины: обучение основам устного профессионального общения**	Лексика по теме (продуктивно). Грамматические конструкции, характерные для устной речи формы профессионального общения.

7	УК4	Раздел 7 **Здоровье и окружающая среда: обучение основам устного профессионального общения**	Лексика по теме (продуктивно). Грамматические конструкции, характерные для устной речи формы профессионального общения.
8	УК4	Раздел 8 **Основы медицины: обучение чтению специальной литературы**	Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии. Лексика по теме (продуктивно). Синтаксис. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

5.2 Разделы дисциплины, виды учебной деятельности и формы текущего контроля

№	№ семестра	Наименование раздела дисциплины	Виды деятельности (в часах)					Формы текущего контроля успеваемости
			Л	ЛР	ПЗ	СРО	всего	
1	2	3	4	5	6	7	8	9
1.	1	Раздел 1 **Медицинское образование: обучение основам устного профессионального общения**	-	-	18	34	52	тестирование, письменный перевод, текущий контроль (ТК) – тестирование, письменный перевод.
2.	1	Раздел 2 **Наука о жизни: обучение чтению специальной литературы**	-	-	40	34	74	текущий контроль (ТК) - тестирование, письменный перевод, реферирование текста.
3.	2	Раздел 3 **История медицины. Выдающиеся медики: обучение основам устного профессионального общения**	-	-	10	6	16	текущий контроль (ТК) - тестирование, письменный перевод текста, беседа на иностр. языке.

4.	2	Раздел 4 **Аптека: обучение основам устного профессионального общения**	-	-	4	6	10	текущий контроль (ТК)-тестирование, письменный перевод текста, беседа на иностр. языке.
5.	2	Раздел 5 **Лекарственные средства: обучение чтению специальной литературы; обучение аннотированию лекарственных препаратов**	-	-	16	6	22	текущий контроль (ТК)-тестирование, письменный перевод, реферирование текста.
6.	2	Раздел 6 **Всемирная организация здравоохранения. Сотрудничество в области медицины: обучение основам устного профессионального общения**	-	-	4	2	6	текущий контроль (ТК) - тестирование, письменный перевод текста, беседа на иностр. языке.
7.	2	Раздел 7 **Здоровье и окружающая среда: обучение основам устного профессионального общения**	-	-	12	6	18	тестирование, письменный перевод, текущий контроль (ТК) - тестирование, письменный перевод, беседа на иностр. языке.
8.	2	Раздел 8 **Основы медицины: обучение чтению специальной литературы**	-	-	12	6	18	текущий контроль (ТК) - тестирование, письменный перевод, реферирование текста.
		ИТОГО:	-	-	116	100	216	

5.3 Название тем лекций с указанием количества часов

Лекции не предусмотрены учебным планом по специальности 35.05.01 Фармация.

5.4. Название тем практических занятий с указанием количества часов

№ п/п	Название тем практических занятий	Кол-во часов в семестре	
		№ 1	№ 2
1	2	3	4
1.	**Тема 1:** О себе и своей будущей профессии	2	
2.	**Тема 2-3:** Медицинское образование в России	4	
3.	**Тема 4-5:** Саратовский государственный медицинский университет	4	
4.	**Тема 6-7:** Рабочий день студента медика	4	
5.	**Тема 8-9:** Медицинское фармацевтическое образование в странах изучаемого языка	4	
6.	**Тема 10-12:** Материя	6	
7.	**Тема 13-15:** Химия	6	
8.	**Тема 16-18:** Клетка	6	
9.	**Тема 19-21:** Клеточное деление (Генетика)	6	
10.	**Тема 22-24:** Гистология. Ткани.	6	
11.	**Тема 25-29:** Ботаника	10	
12.	**Тема 1-3:** История медицины.		6
13.	**Тема 4-5:** Выдающиеся медики. Д.И.Менделеев		4
14.	**Тема 6-7:** Аптека		4
15.	**Тема 8-9:** Рецептура		4
16.	**Тема 10-11:** Лекарственные формы		4
17.	**Тема 12-13:** Способы применения лекарств		4
18.	**Тема 14-15:** Промышленное производство лекарственных средств		4
19.	**Тема 16-17:** ВОЗ. Сотрудничество в области медицины.		4
20.	**Тема 18-19:** Химия и здоровье		4
21.	**Тема 20-21:** Здоровье и окружающая среда		4
22.	**Тема 22-23:** Микробиология		4
23.	**Тема 24:** Организм человека. Части тела, полости, органы и системы органов		2
24.	**Тема 25:** Скелетная система. Скелет. Череп.		2
25.	**Тема 26:** Дыхательная система.		2
26.	**Тема 27:** Система кровообращения.		2

27.	**Тема 28-29:** Пищеварительная система.		4
	ИТОГО	**58**	**58**

5.5. Лабораторный практикум

Лабораторный практикум не предусмотрен учебным планом по специальности 35.05.01 Фармация.

5.6. Самостоятельная работа обучающегося по дисциплине

№ п/п	№ семестра	Наименование раздела	Виды СРО	Всего часов
1	2	3	4	5
1.	**1**	Раздел 1 **Медицинское образование: обучение основам устного профессионального общения**	Подготовка к занятиям. Подготовка к текущему контролю речевых навыков. Подготовка к текущему тестированию.	**34**
2.		Раздел 2 **Наука о жизни: обучение чтению специальной литературы**	Подготовка к занятиям. Подготовка к текущему контролю речевых навыков. Подготовка к текущему тестированию.	**34**
			ИТОГО	**68**
3.	**2**	Раздел 3 **История медицины. Выдающиеся медики: обучение основам устного профессионального общения**	Подготовка к занятиям. Подготовка к текущему контролю речевых навыков. Подготовка к текущему тестированию.	**6**
		Раздел 4 **Аптека: обучение основам устного профессионального общения**	Подготовка к занятиям. Подготовка к текущему контролю речевых навыков. Подготовка к текущему тестированию.	**6**
		Раздел 5 **Лекарственные средства: обучение чтению специальной литературы; обучение аннотированию лекарственных препаратов**	Подготовка к занятиям. Подготовка к текущему контролю речевых навыков. Подготовка к текущему тестированию.	**6**
		Раздел 6 **Всемирная организация здравоохранения. Сотрудничество в области медицины: обучение основам устного профессионального общения**	Подготовка к занятиям. Подготовка к текущему контролю речевых навыков. Подготовка к текущему тестированию.	**2**
		Раздел 7 **Здоровье и окружающая среда: обучение основам устного**	Подготовка к занятиям. Подготовка к текущему контролю речевых навыков. Подготовка к текущему	**6**

		профессионального общения	тестированию.	
		Раздел 8 **Основы медицины: обучение чтению специальной литературы**	Подготовка к занятиям. Подготовка к текущему контролю речевых навыков. Подготовка к текущему тестированию.	**6**
			ИТОГО	**32**

6. ПЕРЕЧЕНЬ УЧЕБНО-МЕТОДИЧЕСКОГО ОБЕСПЕЧЕНИЯ ДЛЯ САМОСТОЯТЕЛЬНОЙ РАБОТЫ ПО ДИСЦИПЛИНЕ

Методические указания для обучающихся по освоению дисциплины указаны в приложении 2.

7. ФОНД ОЦЕНОЧНЫХ СРЕДСТВ ДЛЯ ПРОВЕДЕНИЯ ПРОМЕЖУТОЧНОЙ АТТЕСТАЦИИ

Фонд оценочных средств для проведения промежуточной аттестации обучающихся по дисциплине «Иностранный язык» в полном объеме представлен в приложении 1.

Методические материалы, определяющие процедуру оценивания результатов освоения дисциплины «Иностранный язык» представлены в положении о балльно-рейтинговой оценки академической успеваемости обучающихся.

8. ПЕРЕЧЕНЬ ОСНОВНОЙ И ДОПОЛНИТЕЛЬНОЙ ЛИТЕРАТУРЫ, НЕОБХОДИМОЙ ДЛЯ ОСВОЕНИЯ ДИСЦИПЛИНЫ

8.1. Основная литература

Печатные источники:

№	Издания	Количество экземпляров в библиотеке
1	2	3
1	Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., испр. и перераб. - М. : ГЭОТАР-Медиа, 2010. - 366с.	493
2	Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.	200

Электронные источники

№	Издания
1	2
1	Английский язык для медицинских вузов [Электронный ресурс] : учебник / Маслова А. М., Вайнштейн З. И., Плебейская Л. С. - 5-е изд., испр. - М. : ГЭОТАР-Медиа, 2015. – Режим доступа: http://www.studmedlib.ru/book/ISBN9785970433485.html
2	Английский язык [Электронный ресурс] / Марковина Ирина Юрьевна, Максимова Зинаида Константиновна, Вайнштейн Мария Борисовна - М. : ГЭОТАР-Медиа, 2014. - Режим доступа: http://www.studmedlib.ru/book/ISBN9785970430934.html

8.2. Дополнительная литература

Печатные источники:

№	Издания	Количество экземпляров в библиотеке
1	2	3
1	Английский язык для медиков [Текст] : учеб. пособ. для студ., аспирантов, врачей и науч. сотр. / М. С. Муравейская, Л. К. Орлова. - 7-е изд. - М. : Флинта : Наука, 2003. - 384 с	103

Электронные источники

№	Издания
1	2
1	Англо-русский медицинский словарь [Электронный ресурс] / Под ред. И.Ю. Марковиной, Э.Г. Улумбекова - М. : ГЭОТАР-Медиа, 2013. - Режим доступа: http://www.studmedlib.ru/book/ISBN9785970424735.html
2	Колобаев В.К. Английский язык для врачей [Электронный ресурс]: пособие предназначено для специалистов-медиков и студентов старших курсов/ Колобаев В.К.— Электрон. текстовые данные.— СПб.: СпецЛит, 2013.— 446 с.— Режим доступа: http://www.iprbookshop.ru/47754.html.
3	Муравейская, М.С. Английский язык для медиков [Электронный ресурс] : учеб. пособие / М.С. Муравейская, Л.К. Орлова. — Электрон. дан. — Москва : ФЛИНТА, 2012. — 384 с. — Режим доступа: https://e.lanbook.com/book/13030.

9. ПЕРЕЧЕНЬ РЕСУРСОВ ИНФОРМАЦИОННО-ТЕЛЕКОММУНИКАЦИОННОЙ СЕТИ «ИНТЕРНЕТ»

№ п/п	Сайты
1	http://el.sgmu.ru/
2	www.stanford.edu
3	www.oyc.yale.edu
4	www.ocw.uci.edu
5	http://www.studmedlib.ru
6	www.biblioclub.ru/
7	www.e.lanbook.com/.
8	http://www.iprbookshop.ru
9	http://www.multitran.ru
10	https://translate.yandex.ru/
11	https://translate.google.ru

10. МЕТОДИЧЕСКИЕ УКАЗАНИЯ ДЛЯ ОБУЧАЮЩИХСЯ ПО ОСВОЕНИЮ ДИСЦИПЛИНЫ

Методические указания для обучающихся по освоению дисциплины представлены в приложении 2.

11. ИНФОРМАЦИОННЫЕ ТЕХНОЛОГИИ

1. Адрес страницы кафедры: http://www.sgmu.ru/info/str/depts/flang/index.html.

2. Электронно-библиотечные системы, рекомендованные обучающимся для использования в учебном процессе: 1) ЭБС «Консультант студента» http://www.studentlibrary.ru/ ООО «Политехресурс» Контракт № 797КС/11-2022/414 от 21.12.2022, срок доступа до 31.12.2023
2) ЭБС «Консультант врача» http://www.rosmedlib.ru/ ООО «Высшая школа организации и управления здравоохранением - Комплексный медицинский консалтинг» Контракт № 762КВ/11-2022/413 от 21.12.2022, срок доступа до 31.12.2023
3) ЭБС IPRsmart http://www.iprbookshop.ru/ ООО Компания «Ай Пи Ар Медиа» Лицензионный договор № 9193/22К/247 от 11.07.2022, срок доступа до 14.07.2023г.
4) Национальный цифровой ресурс «Руконт» http://www.rucont.lib.ru ООО Центральный коллектор библиотек "БИБКОМ" Договор № 418 от 26.12.2022, срок доступа до 31.12.2023.
3. Используемое программное обеспечение:

Перечень лицензионного программного обеспечения	**Реквизиты подтверждающего документа**
Microsoft Windows	40751826, 41028339, 41097493, 41323901, 41474839, 45025528, 45980109, 46073926, 46188270, 47819639, 49415469, 49569637, 60186121, 60620959, 61029925, 61481323, 62041790, 64238801, 64238803, 64689895, 65454057, 65454061, 65646520, 69044252 – срок действия лицензий – бессрочно.
Microsoft Office	40751826, 41028339, 41097493, 41135313, 41135317, 41323901, 41474839, 41963848, 41993817, 44235762, 45035872, 45954400, 45980109, 46073926, 46188270, 47819639, 49415469, 49569637, 49569639, 49673030, 60186121, 60620959, 61029925, 61481323, 61970472, 62041790, 64238803, 64689898, 65454057 – срок действия лицензий – бессрочно.
Kaspersky Endpoint Security, Kaspersky Anti-Virus	№ лицензии 2B1E-230301-122909-1-5885 с 2023-03-01 по 2024-03-10, количество объектов 3500.
CentOSLinux	Свободное программное обеспечение – срок действия лицензии – бессрочно
SlackwareLinux	Свободное программное обеспечение – срок действия лицензии – бессрочно
MoodleLMS	Свободное программное обеспечение – срок действия лицензии – бессрочно
DrupalCMS	Свободное программное обеспечение – срок действия лицензии – бессрочно

12. МАТЕРИАЛЬНО-ТЕХНИЧЕСКОЕ ОБЕСПЕЧЕНИЕ

Описание материально-технической базы, необходимой для осуществления образовательного процесса по дисциплине «Иностранный язык» представлено в приложении 3.

13. КАДРОВОЕ ОБЕСПЕЧЕНИЕ

Сведения о кадровом обеспечении, необходимом для осуществления образовательного процесса по дисциплине «Иностранный язык» представлены в приложении 4.

14. ИНЫЕ УЧЕБНО-МЕТОДИЧЕСКИЕ МАТЕРИАЛЫ

Учебно-методические материалы, необходимые для осуществления образовательного процесса по дисциплине «Иностранный язык»:

- Конспекты лекций по дисциплине (не предусмотрено учебным планом)
- Методические разработки практических занятий для преподавателей по дисциплине
- Оценочные материалы для проведения текущего контроля по дисциплине

Разработчики:

доцент, к.псих.н.		Ю.Я.Веретельникова
занимаемая должность	*подпись*	*инициалы, фамилия*
зав.кафедрой, д.с.н.,доц		Е.В.Чернышкова
занимаемая должность	*подпись*	*инициалы, фамилия*

Лист регистрации изменений в рабочую программу

Учебный год	Дата и номер извещения об изменении	Реквизиты протокола	Раздел, подраздел или пункт рабочей программы	Подпись регистрирующего изменения
20___-20___				
20___-20___				
20___-20___				
20___-20___				

Приложение 1

Федеральное государственное бюджетное
образовательное учреждение высшего образования
**«Саратовский государственный медицинский
университет имени В. И. Разумовского»**
Министерства здравоохранения Российской Федерации

УТВЕРЖДАЮ

Декан фармацевтического факультета
_____ Н.А.Дурнова
«18» 04 2023 г.

ФОНД ОЦЕНОЧНЫХ СРЕДСТВ
ДЛЯ ПРОВЕДЕНИЯ ПРОМЕЖУТОЧНОЙ АТТЕСТАЦИИ

Дисциплина: Иностранный язык (английский)

Специальность: 33.05.01 Фармация

Квалификация: Провизор

1. КАРТА КОМПЕТЕНЦИЙ

Контролируемые компетенции	Планируемые результаты обучения
УК-4 Способен применять современные коммуникативные технологии, в том числе на иностранном(ых) языке(ах), для академического и профессионального взаимодействия	ИД$_{УК-4.}$-1 Устанавливает и развивает профессиональные контакты в соответствии с потребностями совместной деятельности, включая обмен информацией и выработку единой стратегии взаимодействия ИД$_{УК-4.}$-2 Составляет, переводит с иностранного языка на государственный язык РФ и с государственного языка РФ на иностранный, а также редактирует различные академические тексты (рефераты, эссе, обзоры, статьи и т.д.), в том числе на иностранном языке ИД$_{УК-4.}$-3 Представляет результаты академической и профессиональной деятельности на различных публичных мероприятиях, включая международные, выбирая наиболее подходящий формат ИД$_{УК-4.}$-4 Аргументированно и конструктивно отстаивает свои позиции и идеи в академических и профессиональных дискуссиях на государственном языке РФ и иностранном языке ИД$_{УК-4.}$-5 Выбирает стиль общения на государственном языке РФ и иностранном языке в зависимости от цели и условий партнерства; адаптирует речь, стиль общения и язык жестов к ситуациям взаимодействия

2. ПОКАЗАТЕЛИ ОЦЕНИВАНИЯ ПЛАНИРУЕМЫХ РЕЗУЛЬТАТОВ ОБУЧЕНИЯ

Семестр	Шкала оценивания			
	«неудовлетворительно»	**«удовлетворительно»**	**«хорошо»**	**«отлично»**
знать				
2	Студент не способен самостоятельно выделять главные положения в изученном материале дисциплины. Не знает основных правил произношения, словообразования; грамматического и стилистического оформления высказывания; базового фонда общеупотребительной и терминологической лексики; основ перевода и реферирования специального медицинского текста.	Студент усвоил основное содержание материала дисциплины, но имеет пробелы в усвоении материала, не препятствующие дальнейшему усвоению учебного материала. Имеет несистематизированные знания об основных правилах произношения, словообразования; грамматического и стилистического оформления высказывания; о базовом фонде общеупотребительной и терминологической лексики; об основах перевода и реферирования специального медицинского текста.	Студент способен самостоятельно выделять главные положения в изученном материале. Знает основные правила произношения, словообразования; грамматического и стилистического оформления высказывания; базовый фонд общеупотребительной и терминологической лексики; основы перевода и реферирования специального медицинского текста.	Студент самостоятельно выделяет главные положения в изученном материале и способен дать краткую характеристику основным идеям проработанного материала дисциплины. Знает основные правила произношения, словообразования; грамматического и стилистического оформления высказывания; базовый фонд общеупотребительной и терминологической лексики; основы перевода и реферирования специального медицинского текста. Показывает глубокое знание и понимание основных положений текста и смысла всего текста в целом; структурной, лексико-грамматической и стилистической организации текста; причинно-следственных, логических и системообразующих связей в структуре текста; тематики устного монологического высказывания и принципов его грамотного оформления.
уметь				
2	Студент не умеет правильно произносить слова; анализировать лексику по	Студент испытывает затруднения при произношении, словообразовании и употреблении лексики; при	Студент умеет самостоятельно и последовательно выполнять лексико-грамматический, структурный и логический	Студент умеет последовательно, систематически и грамотно выполнять лексико-грамматический, структурный и

	словообразовательным элементам; правильно употреблять лексику и грамматические структуры; выполнять грамотный перевод и реферирование специального медицинского текста на всех языковых уровнях; строить устное монологическое высказывание по заданной тематике.	использовании грамматических конструкций; при выполнении перевода и реферирования специального медицинского текста; при оформлении устного монологического высказывания по заданной тематике. Студент непоследовательно и не систематизировано выполняет лексико-грамматический, структурный и логический анализ текста, перевод и реферирование специального медицинского текста. Студент затрудняется при построении устного монологического высказывания по заданной тематике и при ответах на вопросы экзаменатора.	анализ прочитанного текста; выполнять вполне грамотный перевод и реферирование специального медицинского текста; в целом правильно строить устное монологическое высказывание по заданной тематике. Студент умеет использовать изученный лексико-грамматический материал при чтении, переводе и реферировании специального медицинского текста; при оформлении устного монологического высказывания по заданной тематике.	логический анализ прочитанного текста; выполнять качественный перевод и реферирование специального медицинского текста на всех языковых уровнях. Студент умеет самостоятельно и грамотно строить устное монологическое высказывание по заданной тематике и отвечать на вопросы экзаменатора.
владеть				
2	Студент не владеет основными языковыми навыками произношения, словообразования и словоупотребления; использования грамматических конструкций; перевода и реферирования специального медицинского текста; построения устного монологического высказывания по заданной	Студент владеет основными навыками произношения, словообразования и словоупотребления; использования грамматических конструкций; навыками чтения, перевода и реферирования специального медицинского текста; построения подготовленного устного монологического высказывания по заданной тематике. Студент в основном способен самостоятельно выполнять	Студент владеет знаниями всего изученного программного материала, материал излагает последовательно и в основном правильно, но допускает незначительные ошибки и недочеты при воспроизведении изученного материала. Студент способен самостоятельно выделять главные положения в изученном материале, владеет навыком выделения значимых лексико-грамматических, логических и структурных	Студент самостоятельно выделяет главные положения в изученном материале и способен дать краткую характеристику основным идеям проработанного материала. Студент владеет навыком определения лексико-грамматической, структурной и логической организации специального медицинского текста; построения грамотного устного монологического высказывания по заданной тематике. Студент показывает глубокое и

	тематике.	лексико-грамматический, структурный и логический анализ прочитанного текста; строить подготовленное устное монологическое высказывание по заданное тематике. Студент в основном владеет навыками чтения, перевода и реферирования специального медицинского текста; использования изученного лексико-грамматического и текстового материала при подготовке устного монологического высказывания по заданной тематике.	элементов прочитанного текста; выполнять вполне грамотный перевод и реферирование специального медицинского текста; строить вполне грамотное устное монологическое высказывание по заданной тематике; отвечать на вопросы экзаменатора.	полное владение всем объемом изучаемой дисциплины в части способности самостоятельного выделения значимых свойств лексико-грамматических единиц и смысловых частей прочитанного специального медицинского текста; основных положений текстового материала с целью построения связного и грамотно оформленного устного монологического высказывания по заданной тема-тике.

3. ОЦЕНОЧНЫЕ МАТЕРИАЛЫ ДЛЯ ПРОВЕДЕНИЯ ПРОМЕЖУТОЧНОЙ АТТЕСТАЦИИ

Тест
Вариант 1

1. Выберите правильный вариант ответа:
The man was operated on ... appendicitis.
a) against
b) –
c) from
d) for
2. Выберите правильный вариант ответа:
Look ... her skin. It has got a yellowish co lour.
a) for
b) to
c) on
d) at
3. Выберите правильный вариант ответа:
Pancreas is a long thin gland lying ... the stomach.
a) below
b) above
c) after
d) on
4. Выберите правильный вариант ответа:
Respiratory diseases are associated … many complications.
a) of
b) with
c) for
d) –
5. Выберите правильный вариант ответа:
Never show that you are afraid ... injections.
a) –
b) of
c) for
d) from
6. Выберите правильный вариант ответа:
I hope that ... my mother ... my father will help me.
a) either...or
b) not so...as
c) as...as
d) neither...or
7. Выберите правильный вариант ответа:
.... therapeutic ... surgical treatment was effective and the patient's condition became worse.
a) Either...or
b) Both...and
c) Neither...nor
d) Not so...a
8. Выберите правильный вариант ответа:
His temperature is not so ... as it was before the injection.
a) higher
b) high
c) the highest
d) more higher
9. Выберите правильный вариант ответа:
... came to visit me when I was ill.
a) Anything
b) Anybody
c) Nobody
d) Anyone
10. Выберите правильный вариант ответа:

She always tried to do it …
a) herself
b) oneself
c) oneselves
d) ourselves

11. Выберите правильный вариант ответа:
Obstetrics ... very interesting to study.
a) is
b) are
c) were
d) been

12. Выберите правильный вариант ответа:
The initial diagnosis made by the doctor appeared to be correct. ... confirmed by X-ray examination.
a) It was
b) They were
c) It is
d) They are

13. Выберите правильный вариант ответа:
Some students ... part in our experiment because they were interested in Biology.
a) take
b) taking
c) took
d) taken

14. Выберите правильный вариант
If you come at 5 o'clock we ... . Come at 6, please.
a) work
b) shall be working
c) be working
d) are working

15. Выберите правильный вариант
I can’t make the diagnosis. I ... anything like this.
a) has seen
b) seen
c) haven't seen
d) was seen

16. Выберите правильный вариант
I ... got any good ideas about it.
a) am not
b) haven't
c) have
d) was not

17. Выберите правильный вариант
It is known that in this case physiotherapy ... improve the patient's condition.
a) don't
b) doesn't
c) not
d) is not

18. Выберите правильный вариант
The boy with pneumonia ... the necessary treatment.
a) is giving
b) were given
c) gave
d) was given

19. Выберите правильный вариант
X-ray examination ... in 2 hours.
a) will do
b) is doing
c) will be done
d) have done

20. Выберите правильный вариант
If you want to be healthy you ... pay attention to your meals.
a) can
b) should

c) may
d) need

21. Выберите правильный вариант

… the injection of penicillin the nurse left the ward.
a) Giving
b) Having given
c) Given
d) Was given

22.Выберите правильный вариант перевода:

Instruments to be used should be sterilized.
a) Инструменты должны быть использованы для стерилизации.
b) Инструменты необходимо использовать при стерилизации.
c) Инструменты для стерилизации должны быть использованы.
d) Инструменты, которые будут использоваться, следует стерилизовать.

23. Выберите правильный вариант перевода:

To prevent the recurrence of the disease he was administered antibiotics.
a) После предотвращения рецидива болезни ему назначили антибиотики.
b) Для предотвращения рецидива болезни ему назначили антибиотики.
c) Ему назначили антибиотики после рецидива болезни.
d) Из-за рецидива болезни ему назначили антибиотики.

24. Выберите правильный вариант перевода:

It is too late to perform an operation.
a) Это очень поздно делать операцию.
b) Это слишком поздно оперировать.
c) Поздно делать операцию тоже.
d) Делать операцию слишком поздно.

25. Выберите правильный вариант перевода:

One knows that not all types of antibiotics are effective.
a) Кто-то знает, что не все типы антибиотиков эффективны.
b) Не все типы антибиотиков, известные нам, эффективны.
c) Известно, что не все типы антибиотиков эффективны.
d) Он знает, что не все типы антибиотиков эффективны.

ЭТАЛОН ОТВЕТОВ

ВАРИАНТ 1

1 b	11 a	21 b
2 d	12 a	22 d
3 a	13 c	23 b
4 b	14 b	24 d
5 b	15 c	25 c
6 a	16 b	
7 c	17 b	
8 b	18 d	
9 c	19 c	
10 a	20 b	

Результаты апробации и стандартизации:

«отлично» 26-23 правильных ответов;
«хорошо» 16-22 правильных ответов;
«удовлетворительно» 10-15 правильных ответов;
«неудовлетворительно» 9 и меньше правильных ответов.

Вариант 2

1. Выберите правильный вариант ответа:

You'll help me ... next time.
a) in
b) on
c) –
d) at

2. Выберите правильный вариант ответа:

He will be admitted to the hospital ... the end of this week.
a) –
b) on

c) in
d) at

3. Выберите правильный вариант ответа:
Blood passes ... a lot of vessels.
a) on
b) out
c) by
d) through

4. Выберите правильный вариант ответа:
My patient feels a sharp cardiac pain ... the breastbone.
a) behind
b) on
c) after
d) at

5. Выберите правильный вариант ответа:
I am not interested ... this subject
a) in
b) at
c) for
d) of

6. Выберите правильный вариант ответа:
I hope that ... my mother ... my father will help me.
a) either...or
b) not so...as
c) as...as
d) neither...or

7. Выберите правильный вариант ответа:
This operation on the heart is ... dangerous for life than that I performed yesterday.
a) much
b) many
c) most
d) more

8. Выберите правильный вариант ответа:
His temperature is not so ... as it was before the injection.
a) higher
b) high
c) the highest
d) more higher

9. Выберите правильный вариант ответа:
It's not easy to help ... because he is too far.
a) he
b) him
c) himself
d) his

10. Выберите правильный вариант ответа:
It isn't his ward. It's….
a) my
b) mine
c) of me
d) me

11. Выберите правильный вариант ответа:
I had only ... minutes to make the diagnosis because the patient was dying.
a) some
b) no
c) many
d) any

12. Выберите правильный вариант ответа:
We don't know ... about his sensitivity to antibiotics.
a) nothing
b) something
c) anything
d) everything

13. Выберите правильный вариант ответа:

There ... a conference here at 5 o'clock yesterday.
a) is
b) was
c) were
d) are

14. Выберите правильный вариант ответа:
There ... no news about the patient. He is still in the operating room.
a) is
b) shall be
c) are
d) be

15. Выберите правильный вариант ответа:
You ... have a chance to visit Germany next year.
a) was
b) are
c) will
d) shall

16. Выберите правильный вариант ответа:
Some students ... part in our experiment because they were interested in Biology.
a) take
b) taking
c) took
d) taken

17. Выберите правильный вариант ответа:
Don't bother the patient. He ... now.
a) sleeps
b) sleeping
c) is sleeping
d) slept

18. Выберите правильный вариант ответа:
Nobody could help him because all surgeons ... the operation at that moment.
a) was performing
b) were performing
c) performed
d) perform

19. Выберите правильный вариант ответа:
When I entered the ward the nurse ... all the procedures.
a) have completed
b) had completed
c) is completing
d) completed

20. Выберите правильный вариант ответа:
We ... the character of heart defects since the beginning of the year.
a) investigated
b) be investigating
c) was investigating
d) have been investigating

21. Выберите правильный вариант ответа:
The boy with pneumonia ... the necessary treatment.
a) is giving
b) were given
c) gave
d) was given

22. Выберите правильный вариант ответа:
Antibiotic therapy ... next Monday.
a) will discontinue
b) will be discontinued
c) discontinued
d) will have been discontinued

23. Выберите правильный вариант ответа:
… his type of cancer be treated by therapeutic methods?
a) Do
b) Does

c) Can
d) Is

24. Выберите правильный вариант ответа:
The transfusion of blood ... when I entered the operating room.
a) was performed
b) was being performed
c) have been performed
d) have been performing

25. Выберите правильный вариант ответа:
I ... not do those exercises because I had not enough time.
a) can
b) could
c) must
d) should

ЭТАЛОН ОТВЕТОВ

ВАРИАНТ 2

1 c	11 a	21 d
2 d	12 c	22 b
3 d	13 b	23 c
4 a	14 a	24 c
5 a	15 c	25 c
6 a	16 c	
7 d	17 c	
8 b	18 b	
9 b	19 b	
10 b	20 d	

Результаты апробации и стандартизации:
«отлично» 25-23 правильных ответов;
«хорошо» 16-22 правильных ответов;
«удовлетворительно» 10-15 правильных ответов;
«неудовлетворительно» 9 и меньше правильных ответов.

Вариант 3

1. Выберите правильный вариант ответа:
I generally come ... home at 3 o'clock.
a) on
b) to
c) –
d) in

2. Выберите правильный вариант ответа:
Look... her skin. It has got a yellowish co lour.
a) for
b) to
c) on
d) at

3. Выберите правильный вариант ответа:
He will be admitted to the hospital ... the end of this week.
a) –
b) on
c) in
d) at

4. Выберите правильный вариант ответа:
Pancreas is a long thin gland lying ... the stomach.
a) below
b) above
c) after
d) on

5. Выберите правильный вариант ответа:
Respiratory diseases are associated ... many complications.
a) of
b) with
c) for

d) –

6. Выберите правильный вариант ответа:

.Never show that you are afraid ... injections.

a) –

b) of

c) for

d) from

7. Выберите правильный вариант ответа:

Blood passes ... a lot of vessels.

a) on

b) out

c) by

d) through

8. Выберите правильный вариант ответа:

You'll help me ... next time.

a) in

b) on

c) –

d) at

9. Выберите правильный вариант ответа:

I am not interested ... this subject.

a) in

b) at

c) for

d) of

10. Выберите правильный вариант ответа:

… therapeutic ... surgical treatment was effective and the patient's condition became worse.

a) Either...or

b) Both...and

c) Neither...nor

d) Not so...as

11. Выберите правильный вариант ответа:

It's not easy to help ... because he is too far.

a) he

b) him

c) himself

d) his

12. Выберите правильный вариант ответа:

.... came to visit me when I was ill.

a) Anything

b) Anybody

c) Nobody

d) Anyone

13. Выберите правильный вариант ответа:

I had only ... minutes to make the diagnosis because the patient was dying.

a) some

b) no

c) many

d) any

14. Выберите правильный вариант ответа:

Obstetrics … very interesting to study.

a) is

b) are

c) were

d) been

15. Выберите правильный вариант ответа:

There … no news about the patient. He is still in the operating room.

a) is

b) shall be

c) are

d) be

16. Выберите правильный вариант ответа:

The child's mother said that her daughter's temperature ... 39 degrees.

a) is
b) was
c) will be
d) –

17. Выберите правильный вариант ответа:
There ... a conference here at 5 o'clock yesterday.
a) is
b) was
c) were
d) are

18. Выберите правильный вариант ответа:
You ... have a chance to visit Germany next year.
a) was
b) are
c) will
d) shall

19. Выберите правильный вариант ответа:
.... this type of cancer be treated by therapeutic methods?
a) Do
b) Does
c) Can
d) Is

20. Выберите правильный вариант ответа:
I ... got any good ideas about it.
a) am not
b) haven't
c) have
d) was not

21. Выберите правильный вариант ответа:
Nobody could help him because all surgeons ... the operation at that moment.
a) was performing
b) were performing
c) performed
d) perform

22. Выберите правильный вариант ответа:
Some students … part in our experiment because they were interested in Biology.
a) take
b) taking
c) took
d) taken

23. Выберите правильный вариант ответа:
It is known that in this case physiotherapy ... improve the patient's condition.
a) don't
b) doesn't
c) not
d) is not

24. Выберите правильный вариант ответа:
When I entered the ward the nurse ... all the procedures.
a) have completed
b) had completed
c) is completing
d) completed

25. Выберите правильный вариант ответа:
The transfusion of blood ... when I entered the operating room.
a) was performed
b) was being performed
c) have been performed
d) have been performing

ЭТАЛОН ОТВЕТОВ

ВАРИАНТ 3

1 c	11 b	21 b
2 d	12 c	22 c

3 d	13 a	23 b
4 a	14 a	24 b
5 b	15 a	25 b
6 b	16 b	
7 d	17 b	
8 c	18 c	
9 a	19 c	
10 c	20 b	

Результаты апробации и стандартизации:
«отлично» 25-23 правильных ответов;
«хорошо» 16-22 правильных ответов;
«удовлетворительно» 10-15 правильных ответов;
«неудовлетворительно» 9 и меньше правильных ответов.

Вариант 4

1. Выберите правильный вариант ответа:
Blood passes ... a lot of vessels.
a) on
b) out
c) by
d) through

2. Выберите правильный вариант ответа:
I am not interested ... this subject.
a) in
b) at
c) for
d) of

3. Выберите правильный вариант ответа:
You should go ... bed as soon as the procedure is over.
a) to
b) at
c) –
d) out

4. Выберите правильный вариант ответа:
My patient feels a sharp cardiac pain ... the breastbone.
a) behind
b) on
c) after
d) at

5. Выберите правильный вариант ответа:
Pancreas is a long thin gland lying ... the stomach.
a) below
b) above
c) after
d) on

6. Выберите правильный вариант ответа:
I hope that... my mother ... my father will help me.
a) either...or
b) not so...as
c) as...as
d) neither...or

7. Выберите правильный вариант ответа:
This operation on the heart is ... dangerous for life than that I performed yesterday.
a) much
b) many
c) most
d) more

8. Выберите правильный вариант ответа:
.... came to visit me when I was ill.
a) Anything
b) Anybody

c) Nobody
d) Anyone

9. Выберите правильный вариант ответа:
We don't know ... about his sensitivity to antibiotics.
a) nothing
b) something
c) anything
d) everything

10. Выберите правильный вариант ответа:
I had only ... minutes to make the diagnosis because the patient was dying.
a) some
b) no
c) many
d) any

11. Выберите правильный вариант ответа:
It's not easy to help ... because he is too far.
a) he
b) him
c) himself
d) his

12. Выберите правильный вариант ответа:
She always tried to do it …
a) herself
b) oneself
c) oneselves
d) ourselves

13. Выберите правильный вариант ответа:
Nobody could help him because all surgeons ... the operation at that moment.
a) was performing
b) were performing
c) performed
d) perform

14. Выберите правильный вариант ответа:
I can't make the diagnosis. I ... anything like this.
a) has seen
b) seen
c) haven't seen
d) was seen

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We ... the character of heart defects since the beginning of the year.
a) investigated
b) be investigating
c) was investigating
d) have been investigating

16. Выберите правильный вариант ответа:
Antibiotic therapy ... next Monday.
a) will discontinue
b) will be discontinued
c) discontinued
d) will have been discontinued

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The transfusion of blood ... when I entered the operating room.
a) was performed
b) was being performed
c) have been performed
d) have been performing

18. Выберите правильный вариант ответа:
I ... got any good ideas about it.
a) am not
b) haven't
c) have
d) was not

19. Выберите правильный вариант ответа:

... this type of cancer be treated by therapeutic methods?
a) Do
b) Does
c) Can
d) Is

20. Выберите правильный вариант ответа:
The ... child was given inhalations.
a) cough
b) coughing
c) was coughing
d) coughs

21. Выберите правильный вариант ответа:
Electrocardiogram ... during the attack showed disturbances of blood flow.
a) taking
b) have taken
c) taken
d) was taken

22. Выберите правильный вариант ответа:
... the injection of penicillin the nurse left the ward.
a) Giving
b) Having given
c) Given
d) Was given

23. Выберите правильный вариант ответа:
If you want to be healthy you ... pay attention to your meals.
a) can
b) should
c) may
d) need

24. Выберите правильный вариант ответа:
I ... not do those exercises because I had not enough time.
a) can
b) could
c) must
d) should

25. Выберите правильный вариант перевода:
Instruments to be used should be sterilized.
a) Инструменты должны быть использованы для стерилизации.
b) Инструменты необходимо использовать при стерилизации.
c) Инструменты для стерилизации должны быть использованы.
d) Инструменты, которые будут использоваться, следует стерилизовать.

ЭТАЛОН ОТВЕТОВ

ВАРИАНТ 4

1 d	11 b	21 c
2 a	12 a	22 b
3 a	13 b	23 b
4 a	14 c	24 b
5 a	15 d	25 d
6 a	16 b	
7 d	17 b	
8 c	18 b	
9 c	19 c	
10 a	20 b	

Результаты апробации и стандартизации:
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«неудовлетворительно» 9 и меньше правильных ответов.

Перечень устных экзаменационных тем

1. Фармацевтическое образование.
2. Саратовский государственный медицинский университет.
3. Менделеев Д.И.
4. Аптека.
5. Всемирная организация здравоохранения.
6. Здоровье и окружающая среда.

Вопросы к устным экзаменационным темам

Pharmaceutical Education

1. What are the requirements for those wishing to get higher pharmacy education?
2. How long does the education last?
3. What are the periods of education?
4. What subjects do the students study?
5. When do the students take state exams?

Saratov State Medical University

1. When was the university founded?
2. Who was the first rector of the University?
3. What were the first departments of the University?
4. What famous scientists worked at the University?
5. What are the faculties of SSMU?

D.I. Mendeleev

1. What is D.I. Mendeleev famous for?
2. What do you know about the famous scientist's biography?
3. What fields of science did he work in?
4. What is the great scientist's main discovery in the field of chemistry?
5. What other important contributions did Mendeleev make to Chemistry and Physics?

Chemist's

1. What is chemist's or drug store?
2. What are the departments of a chemist's?
3. What kinds of medicines can one get at the chemist's department?
4. What kinds of medicines are sold by prescription?
5. What are the duties of a pharmacist?

World Health Organization

1. What is the World Health Organization?
2. When was it established?
3. What is the historical background of WHO?
4. What are the main areas of its work?
5. What are the types of cooperation in the field of medicine?

Health and Environment

1. What is ecology?
2. What sub-disciplines contribute to the science of ecology?
3. What major human activities affect the ecologic balance?
4. What is an ecosystem?
5. What does ecological crisis mean?

Вопросы по изучаемым темам

Working day of a medical student

1. Where do you study?
2. What faculty do you study at?
3. When does your working day begin?
4. What subjects do you study?
5. What do you do after classes?

Matter

1. What is matter?
2. What are the states of matter?
3. What do physics and chemistry study?
4. What are physical and chemical properties of matter?
5. What are analysis and synthesis?

Cytology

1. What is cytology?
2. What is a cell?
3. What are the main organelles of the cell?
4. What is phagocytosis?
5. What if pinocytosis?

Genetics

1. What is genetics?
2. What is the basic unit of heredity?
3. What controls hereditary traits?
4. What is mitosis?
5. What is meiosis?

Chemistry

1. What does chemistry study?
2. What are the main types of substances?
3. What properties do substances have?
4. What are physical properties of substances?
5. What are chemical properties of substances?

Microbiology

1. What is microbiology?
2. What are the most common microorganisms?
3. What are the portals of entry of infection?
4. What is bacteraemia?
5. What is viraemia?

Human body

1. What is a human organism?
2. What are the main parts of the human body?
3. What are the systems of the body?
4. What cavities are there in the human body?
5. What paired organs are there in the human body?

Histology

1. What does histology deal with?
2. What is a tissue?
3. What are the main groups of tissues?
4. What is the difference between various types of tissues?
5. What are the functions of various groups of tissues?

Botany

1. What is Botany?
2. What does botany deal with?
3. What is a plant? Flower?
4. What are the main groups of plants?
5. What are the different types of plat/flower parts?

ЭКЗАМЕНАЦИОННЫЕ ТЕКСТЫ ДЛЯ РЕФЕРИРОВАНИЯ И ПЕРЕВОДА

MULTIFACTORIAL INHERITANCE

The term multifactorial inheritance refers to the process in which a disease or abnormality- is the result of the additive effect of one or more abnormal genes and environmental factors. The disorders attributed to this process include some of the most common malformations as well as medical conditions like allergic disorders, schizophrenia, and some types of hyperlipidemia. The number of genes involved is not known. Some investigators have postulated that the genes involved are "minor genes," which individually are not harmful but have a cumulative effect that is harmful; others postulate that genes that exert a major effect are also involved. Few of the environmental factors have been identified in humans; studies of conditions caused by multifactorial inheritance in animals emphasize their relevance. Some of the nongenetic features identified in humans include seasonal variation in the occurrence of the disorder, increased frequency in families living in poor socioeconomic conditions, and uterine factors. A considerable amount of data must be available on many effected persons and their families before the disease or malformation is attributed to multifactorial inheritance. This term should not be used whenever the cause of familial occurrence is poorly understood.

Some of the features of multifactorial inheritance are similar to mendelian inheritance of single mutant genes, e.g., the incidence of specific conditions varies according to racial background; this racial predisposition persists after migration to other countries.

Most of the, features of multifactorial inheritance, however, are quite different from those observed in mendelian inheritance of a single mutant gene: (1) There is a similar rate of recurrence (usually 2-10%;) among all first-degree relatives (parents, siblings, and offspring of the affected infant). For example, if a couple has had 1 child with deft lip and palate, the risk that the next will be affected is about 4%; if 1 parent has cleft-lip and palate, the chance that the 1st child will have the same malformation is also about 4%. (2) Some disorders have a sex predilection. For example, pyloric stenosis' is much more common in males, whereas congenital dislocation of hips is much more common in females. (3) If there is an altered sex ratio, the affected person of the sex less likely to be affected is much more apt to have affected children. For example, a woman who had pyloric stenosis as an infant has a 25% chance of having a child similarly affected; the risk for the children of the father who had pyloric stenosis is only 4%. (4) The likelihood that both of identical twins will be affected with the same malformation is less than 100% but much greater than the chance that both nonidentical twins will be affected. This distribution contrasts with that of mendelian inheritance, in which identical twins always share a disorder due to a single mutant gene. (5) The risk of recurrence in subsequent pregnancies depends on the outcome in previous pregnancies. For example, the risk of recurrence for deft lip and palate is 4% for a couple with 1 affected child, but 9% after they have had 2 affected children. (6) The risk of abnormality in offspring is directly related to the severity of the malformation. For example, the infant who has congenital intestinal aganglionosis of a long segment of bowel has a greater chance of having an affected sibling than the infant who has aganglionosis of only a small segment.

GENERAL CLINICAL PRINCIPLES IN GENETIC DISORDERS

The Negative Family History A child with a genetic disease or malformation is usually the only known affected member of his or her family. This reflects the fact that the rates of recurrence are very low for common abnormalities of the chromosomes and for conditions attributed to multifactorial inheritance. For example, the recurrence risk for Down syndrome associated with trisomy-21 is 1%; for conditions attributed to multifactorial inheritance it varies from 2-10%. The recurrence risk for disorders with a mendelian pattern of inheritance is much higher (e.g., 25% for autosomal recessive disorders), but in small families it is more likely that autosomal recessive disorder will affect only l of 3 or,4 children rather than 2. In the case of autosomal dominant disorders, the child may be affected by a spontaneous genetic mutation rather than by inheriting the mutant gene from an affected parent. Generally speaking, a negative family history may be misleading.

Environmental Factors Since the family history is usually negative for the disorder under consideration, the parents often blame themselves and look for environmental factors which might have been the cause. The physician should anticipate their feelings of guilt and carefully discuss the events, including medications taken, to which congenital disorders may be attributed inappropriately parents.

Genetic Heterogeneity A single clinical manifestation may have more than 1 cause. An elevation in serum phenylalanine may be associated with classic phenylketonuria (either absence or deficiency of phenylalanine hydropxylase); absence or deficiency of the enzyme pteridin reductase; or deficient biopterin synthesis. Arachnodactyly may be an isolated characteristic of a tall, thin person, or it may be a feature of a number of genetic disorders, including Marfan syndrome and contractural arachnodactyly.

ALTERATIONS IN BODI TEMPERATURE

DISTURBANCES OF HEAT REGULATION

CONTROL OF BODY TEMPERATURE In health, the body temperature of human beings is maintained within a narrow range despite extremes in environmental conditions and physical activity. This is also true for most birds and mammals, and such animals are termed *homeothermic*, or warm-blooded. An almost invariable accompaniment of systemic illness is a disturbance in temperature regulation, usually an abnormal elevation, or *fever.* In fact, fever is such a sensitive and reliable indicator of the presence of disease that thermometry is probably the commonest clinical procedure in use. Even in the

absence of a frank febrile response, interference with heat regulation by disease is evident. This may take the form of flushing, pallor, sweating, shivering, and abnormal sensations of cold or warmth, or it may consist of erratic fluctuations of body temperature within normal limits when a patient is at bed rest.

Heat production The major source of basal heat production is through thyroid thermogenesis and the action of adenosine triphosphatase (ATPase) on the sodium pump of all membranes. The muscles are most important in promoting increased heat production through increased shivering. Heat production by muscle is of particular importance because the quantity can be varied according to the need. In most circumstances this variation consists of small increases and decreases in the number of nerve impulses to the muscles, causing inapparent tensing or relaxing. When, however, there is a strong stimulus for heat production, muscle activity may increase to the point of shivering, or even to a generalized rigor.

Heat loss Heat is lost from the body in several ways. Small amounts are used in warming food or drink and in the evaporation of moisture from the respiratory tract. Most heat is lost from the surface of the body, by *convection,* i.e., the transfer of heat to a fluid medium. Heat loss by convection depends on the existence of a temperature gradient between the body surface and the ambient air. A second mechanism for heat loss is *radiation,* which may be defined as an exchange of electromagnetic energy between (he body and the radiant environment. *Evaporation* is the third major mechanism for dissipating heat and is particularly important when the ambient temperature exceeds that of the body.

The principal method of regulating heat loss is by varying the volume of blood flowing to the surface of the body. A rich circulation in the skin and subcutaneous tissues carries heat to the surface, where it can escape. In addition, sweating increases heat loss by providing water to be vaporized. The sweat, or eccrine, glands are under the control of the sympathetic nerves which, in this instance, mediate cholinergic stimuli. Heat loss by sweating may be tremendous, and as much as 1 liter per hour of sweat may be evaporated. The amount of heat loss through sweating is also dependent upon the humidity in the air. The greater the humidity, the less the ability to lose heat through sweat.

When there is need for conservation of heat, adrenergic autonomic stimuli cause a sharp reduction in the blood flow to the surface. This causes vasocontriction and transforms the skin and subcutaneous tissue into layers of insulation.

Heat transfer within the body. This depends upon *conduction* i. e., the transfer of heat between adjacent organs, and upon *circulatory convection,* which is governed by bulk movement of body fluids and which is responsible for the transfer of heat between the cells and the bloodstream. It is useful, although oversimplified, to visualize the body as a central core at uniform temperatures surrounded by an insulating shell. The role of the shell as a mediator for heat conservation and heat loss is determined in part by its blood supply and by vasoconstriction or vasodilatation. Although insulation is relatively uniform throughout the body, some parts, such as the digits, are particularly susceptible to cold because of the increased surface-to-volume ratio. Moreover, blood that reaches the digits has already been cooled on the way. Insulation may be enhanced by the addition of clothing.

Neural control of temperature The control of body temperature, integrating the various physical and chemical processes for heat production or heat loss, is a function of cerebral centers located in the hypothalamus. A high-decerebrate animal has a normal temperature if the hypothalamus is left intact. On the other hand, an animal whose brainstem has been sectioned loses ability to control body temperature, which consequently tends to vary with the environment, a condition referred to as *poikilothermia.* Animal experiments suggest that the preoptic anterior hypothalamus and some centers in the spinal cord have neurons which respond directly to local temperature and act as a sensor for internal temperature. This function is distinct from the integrative function which responds to temperature-sensitive structures all over the body.

FACTORS AFFECTING NEURAL CONTROL OF TEMPERATURE The

temperature-regulating system is a negative feedback control system, and possesses three elements essential to such a system: (1) receptors which sense the existing central temperatures; (2) effector mechanisms, consisting of the vasomotor, sudomotor, and metabolic effectors, and (3) integrative structures which determine whether the existing temperature is too high or too low and which activate the appropriate motor response. It is a negative feedback system because a rise in central temperature initiates mechanisms for losing heat while a fall in central temperature activates mechanisms for heat production and heat conservation. The activation of these effector responses is governed by a central integrative mechanism which may be compared with a thermostat and which responds to a variety of stimuli, such as the sensory impulses engendered in flushing or sweating, behavioral impulses, exercise, endocrine influences, and probably the temperature of the blood circulating through the hypothalamic centers. In a sense all these stimuli reset the thermostat.

A classic example of the endocrine influence on temperature is the effect of menstruation. The mean body temperature of women is higher during the second half of the menstrual cycle than it is between the onset of menstruation and the time of ovulation. The sensations of intense heat followed by diaphoresis that characterize the vasomotor instability experienced by some women at the menopause are undoubtedly the result of endocrine imbalance. The activation of the adrenal medulla in response to cold is another example of the relationship between the endocrine system and the thermoregulatory apparatus.

DISORDERS ASSOCIATED WITH HIGH TEMPERATURES Heat syndromes Four clinical syndromes are associated with high environmental temperature: *heat cramps, heat exhaustion, exertional heat injury,* and *heat stroke.* Although each of these entities may be separated from the other on clinical grounds, there is considerable overlap between them, and they may be considered as a series of syndromes along a single spectrum. The incidence of heat syndromes is unknown, but during an ordinary summer about 200 cases of heat stroke are reported. During the heat wave of July 1980, 1265 deaths from heat stroke were reported—784 from Kansas City and St. Louis alone. Heat syndromes occur primarily at elevated temperatures (>90°F) and at high humidities (>60%); and elderly individuals, those with mental illness or alcoholism or who receive antipsychotic drugs, diuretics, and anticholinergics, or those who reside in poorly ventilated places without air

conditioning are most susceptible. Heat syndromes are especially prevalent during the first days of a heat wave before effective acclimatization can occur.

ALTERATIONS IN CIRCULATORY AND RESPIRATORY FUNCTION

COUGH AND HEMOPTYSIS

COUGH Cough, one of the most frequent cardio respiratory symptoms, is an explosive expiration which provides a means of clearing the tracheo bronchial tree of secretions and foreign bodies.

MECHANISM Coughing may be initiated either voluntarily or reflex. As a defensive reflex it has both afferent and efferent pathways. The *afferent limb* includes cough receptors within the sensory distribution of the trigeminal, glossopharyngeal, superior laryngeal, and vagus nerves. The *efferent limb* includes the recurrent laryngeal nerve (which causes glottic closure) and the spinal nerves (which cause contraction of the thoracic and abdominal musculature). The *sequence of a cough* includes an appropriate stimulus, which initiates a deep inspiration. This is followed by glottic closure, relaxation of the diaphragm, and muscle contraction against a closed glottis so as to produce maximally positive intrathoracic and intraairway pressures. These positive intrathoracic pressures result in a narrowing of the trachea, produced by an infolding of its more compliant posterior membrane. Once the glottis opens, the combination of a large pressure differential between the airways and the atmosphere coupled with this tracheal narrowing produces flow rates through the trachea close to the speed of sound. The shearing forces, which are developed aid in the elimination of mucus and foreign materials. A tracheostomy short-circuits glottic closure and therefore decreases the effectiveness of the cough mechanism.

ETIOLOGY Cough is produced by inflammatory, mechanical, chemical, and thermal stimulation of the cough receptors. *Inflammatory* stimuli are initiated by edema and hyperemia of the respiratory mucous membranes, and by irritation from exudative processes. Such stimuli may arise either in the airways (as in laryngitis, tracheitis, bronchitis, and bronchiolitis) or in the alveoli (as in pneumonitis and lung abscess). *Mechanical* stimuli are produced by inhalation of particulate matter, such as dust particles, and by compression of the air passages and pressure or tension upon these structures. Lesions associated with airway compression may be either extramural or intramural in type. The former include aortic aneurysms, granulomas. Pulmonary neoplasms, and mediastinal tumors: intramural lesions include bronchogenic carcinoma, bronchial adenoma, foreign bodies, granulomatous endobronchial involvement, and contraction of airway smooth muscle (bronchial asthma). Pressure or tension upon the air passages is usually produced by lesions associated with a decrease in pulmonary compliance. Examples of specific causes include acute and chronic interstitial fibrosis pulmonary edema, and atelectasis. *Chemical* stimuli may result from inhalation of irritant gases, including cigarette smoke and chemical fumes. Finally, *thermal* stimuli may be produced by inhalation of either very hot or cold air.

Cough is commonly associated with episodic wheezing secondary to bronchoconstriction in symptomatic patients with bronchial asthma. Recent reports have drawn attention to patients with chronic, persistent cough as the *sole* presenting manifestation of bronchial asthma. Such patients are characterized by (1) absence of a history of episodic wheezing and (2) no evidence of expiratory airflow obstruction by spirometry, but (3) hyperreactive airways (characteristic of asthma) when challenged with a cholinergic agent, methacholine.

DIAGNOSTIC EVALUATION When one is considering the above list of causes, чanswers to the following general questions will significantly narrow the diagnostic possibilities: Is the cough acute or chronic? Is it productive of sputum or nonproductive? A chronic productive cough may be caused by diseases such as chronic bronchitis, pulmonary tuberculosis, and pulmonary neoplasms. Are the findings on physical examination of the chest normal or abnormal? Is the chest roentgenogram normal or abnormal?

Features of the history, physical examination, chest roentgenogram, screening pulmonary function studies (static lung volumes and dynamic flow rates), and sputum examination may indicate a specific cause. The *history* may indicate specific diagnoses. Acute episodes of cough may be associated with such viral infections as acute tracheobronchitis or pneumonitis or with bacterial bronchopneumonia. Cough associated with an acute febrile episode and associated with hoarseness is usually produced by viral laryngotracheobronchitis. The character of the cough may suggest the anatomic site of involvement: the patient with a "barking" type of cough may have epiglottal involvement, while the cough associated with tracheal or major airway involvement is often loud and "brassy." Cough associated with generalized wheezing may be produced by acute bronchospasm. The time of occurrence of a cough may indicate a specific cause: a cough which occurs selectively at night suggests congestive heart failure; one related to meals suggests a tracheoesophageal fistula, a hiatal hernia, or an esophageal diverticulum; a cough precipitated by a change in position suggests a lung abscess or a localized area of bronchiectasis. The description of sputum or secretions produced in conjunction with the cough may also be helpful: putrid sputum suggests a lung abscess; bloody sputum, bleeding (see "Hemoptysis." be- low), frothy and pink-tinged sputum, pulmonary edema; mucoid and massive sputum, alveolar cell carcinoma; purulent and/or large amounts of sputum, lung abscess and bronchiectasis.

On *physical examination* the character of the auscultatory findings may suggest the site of disease: inspiratory stridor and wheezing» may be present in laryngeal disease, inspiratory and expiratory bronchi favor tracheal and major airway involvement, coarse subcrepitant inspiratory rales may indicate interstitial fibrosis and/or edema, fine crepitant rales may indicate a process such as pneumonitis or pulmonary edema, which fills the alveoli with fluid. The *chest roentgenogram* may reveal the cause of the cough; it may show an intrapulmonary mass lesion, which may be either central or peripheral (Chap. 284) an alveolar filling process which may be pneumonic or nonpneumonic an area of honeycombing and cyst formation which may indicate an area of localized bronchiectasis, or bilateral hilar adenopathy which may indicate sarcoidosis or a lymphoma.

Screening pulmonary function studies may also indicate specific diagnoses. Significant expiratory obstruction to airflow (as determined from a forced expiratory flow maneuver), coupled with a history of cough and significant sputum production, suggests that irrespective of other lesions the patient has significant bronchitis. Decreased lung volume (as determined from the static lung volumes) indicates that a restrictive type of lung disease is presentreduction of lung volumes produced by thoracic, pleural, alveolar, or interstitial disease. Finally, a careful *sputum examination* may be more enlightening than a patient's description of the character of the sputum. Examination shows whether the sputum is thin or viscid, purulent or not, foul-smelling or not, blood-tinged or not, scant or copious. Gram stain and culture of the deep-cough specimen may reveal a specific bacterial, fungal, or mycoplasmal causation, while sputum cytology may result in a positive diagnosis of a pulmonary neoplasm.

Two features of cough should be highlighted: (1) A Cough is often so common in the cigarette smoker as to be ignored or minimized. *Any change in the nature or character of a chronic cigarette cough should initiate immediate diagnostic evaluation, with particular attention directed to detection of bronchogenic carcinoma.* (2) Female patients are inclined to swallow sputum and not to expectorate as male patients do. This tendency may lead to the incorrect conclusion that a cough in a female patient is irritative and nonproductive.

CHRONIC HYPOTENSION

Although many patients have been treated for chronic "low blood pressure," most of them, with systolic pressures in the range of 90 to 110 mmHg, are normal and may actually have a greater life expectancy than those with "normal" pressures. Patients with true chronic hypotension may complain of lethargy, weakness, easy fatigability, and dizziness or faintness, especially if arterial pressure is lowered further when the erect position is assumed. These symptoms are presumably due to a decrease in perfusion of the brain, heart, skeletal muscle, and other organs.

Chronic hypotension occasionally results from severe reductions of the cardiac output. The major endocrine causes of chronic hypotension are associated with deficient gluco- and mineralocorticoid secretion and resultant reductions of the intravascular and interstitial fluid volume. Hypotension is usually more pronounced in patients with primary adrenocortical insufficiency than in those with hypopituitarism because secretion of the sail-retaining adrenocortical hormone, aldosterone, is partially preserved in pituitary insufficiency.

Malnutrition, cachexia, chronic bed rest, and a variety of neurologic disorders may result in chronic hypotension, especially in the standing position. Interference with the neural pathways anywhere between the vasomoior center and the efferent sympathetic nerve endings on the blood vessels or heart may prevent the vasoconstriction and increase in cardiac output which occur as a normal response to a reduction in arterial pressure. Multiple sclerosis, amyotrophic lateral sclerosis, syringomyelia, syphilitic or diabetic tabes dorsalis, peripheral neuropathies, spinal cord section, diabetic neuropathy, extensive lumbodorsal sympathuctomy, and the administration of drugs interfering with nerve transmission in the sympathetic nervous system are all associated with orthostatic hypotension.

HYPERTENSION

DIAGNOSIS Patients with elevations of arterial pressure are usually asymptomatic, and the blood pressure abnormality often arouses attention only incidentally during military, life insurance, or other periodic physical examinations.

ETIOLOGY A specific cause for the elevated arterial pressure cannot be defined for most patients with hypertension. The percentage of patients with so-called idiopathic, essential, or primary hypertension is high, varying from 80 to 95 percent depending on both the patient population and how extensive the "routine" evaluation is. More specific etiologic relationships have been established for a smaller group of patients with systemic hypertension. Primary renal diseases associated with the development of serious hypertension (as distinguished from renal damage secondary to hypertension) have been recognized for years, although in many cases the exact mechanism of blood pressure elevation is unknown. In some instances it is due to activation of the renin-angiotensin-aldosterone axis; in others, perhaps it is related to a reduced ability to excrete sodium and the sequence already described.

The most clearly defined etiologic relationships in the development of hypertension are found among the endocrine disorders. Adrenocortical hormones have also been implicated in the hypertensive syndromes associated with tumors or hyperplasia of the anterior pituitary (Cushing's syndrome, primary hyperaldosteronism. As well as with various congenital or hereditary enzyme defects (hypertensive adrenogenital syndromes). Secretion of excessive quantities of the pressor catecholamines, norepinephrine and epinephrine, associated with pheochromocytomas, i.e., chromaffin cell tumors arising from the adrenal medulla or sympathetic ganglia, is also commonly associated with hypertension. Up to 50 percent of patients with acromegaly may have hypertension, but the mechanism of their blood pressure elevation is less clear.

EFFECTS OF HYPERTENSION Patients with untreated hypertension die prematurely, most commonly due to heart disease, with strokes and renal failure also frequently occurring.

APPROACH TO THE PATIENT WITH HYPERTENSION The physician's first task is to determine whether or not a patient with a given level of arterial pressure has hypertension. Then, determinations of the extent of pretreatment evaluation, whether or not to treat, how to treat, and how frequently to reevaluate are necessary. In general, it is preferable to measure arterial pressure on several occasions prior to starting therapy using a mercury sphygmomanometer with the patient seated. Initial history, physical examination, and laboratory evaluation should be directed at uncovering correctable secondary forms of hypertension.

An assessment of the following areas in the medical history 'is particularly important: family or personal history of hypertension; drugs or dietary factors which may aggravate the hypertension, e.g., high salt intake, oral contraceptives, and hormones; cardiovascular risk factors including diabetes mellitus, smoking, lipid abnormalities, or strokes; cardiac or renal dis-

ease; and symptoms suggestive of secondary forms of hypertension, e.g., muscle cramps and weakness associated with primary aldosteronism or episodic headaches, palpitations, and sweating associated with pheochromocytoma.

The *physical examination* should include a standing blood pressure, height, weight, funduscopic examination, assessment of thyroid size, bruits in neck or abdomen, peripheral pulses including determination of synchrony between upper and lower extremities, examination of the heart for size, rate, murmurs, gallops, auscultation of the lungs, examination of the abdomen for masses, and particularly kidney size, and a neurologic examination to assess the presence of deficits associated with a stroke.

The basic *laboratory evaluation* should consist of hematocrit, urinalysis, blood urea nitrogen or creatinine, serum potassium, ECG, and chest x-ray. Often blood glucose, uric acid, and cholesterol determinations and a blood count are also useful, particularly since they may be part of a battery of automated blood tests that as a group are about the same price as the individual tests listed above. Other studies to identify secondary forms of hypertension may be indicated on the basis of the initial therapy or physical examination.

If the diastolic pressure is consistently higher than 90 mm Ug, therapy is almost always indicated unless contraindications exist.

Therapy should be directed at reducing the arterial pressure to or near normal levels, since studies have documented the morbidity and mortality are reduced. In order to minimize drug side effects in achieving this goal, a "step-care approach' has been advocated. The principle involves initiating therapy with a small dose of a single drug, usually a thiazide diuretic increasing the dose of that drug, and then adding a beta-adrenergic blocker and. if necessary, other drugs one at a time. The therapeutic regimen should be revised as dictated by the arterial pressure measured at periodic intervals. The frequency of reevaluation should be as often as weekly while blood pressure is being lowered in patients with initial diastolic pressures greater than 115 mmHg, and approximately every 4 months in symptom-free patients on stable treatment programs.

The specific drugs are discussed elsewhere. However, it is important to emphasize here that control of arterial pressure is a lifelong endeavor the success of which is often dependent on the physician's ability to motivate the patient to adhere to the therapeutic program and to recognize the pharmacologic interactions and adverse reactions of antihypertensive agents.

ANOREXIA, NAUSEA, AND VOMITING

Anorexia, or loss of the desire to eat, is a prominent symptom in a wide variety of intestinal and extraintestina1 disorders. It must be clearly differentiated from satiety and from specific food intolerance. Anorexia occurs in many disorders and as a result *by itself is of little if specific diagnostic value.* The mechanisms whereby hunger and appetite are modified in various disease states are poorly understood. Normally food intake is regulated by two hypothalamic centers - a lateral "feeding center" and a ventromedial "satiety center." The latter inhibits the feeding center following a meal, leading to the sensation of satiety. There is increasing evidence to suggest that the brain-gut peptide cholecystokinin (CCK) has a satiety effect and is involved in the regulation of feeding behavior. Anorexia is commonly seen in diseases of the gastrointestinal tract and liver. For example, it may precede the appearance of jaundice in hepatitis, or it may be a prominent symptom in gastric carcinoma. In the setting of intestinal disease, anorexia should be clearly differentiated from *sitophobia,* or fear of eating because of subsequent or associated discomfort. In such S. circumstances, appetite may persist, but the ingestion of food is curtailed nonetheless. Sitophobia may be seen, for example, in regional enteritis (especially with partial obstruction) or in patients with gastric ulcer following partial or total gastrectomy. Anorexia may also be a prominent feature of severe extraintestinal diseases. For example, anorexia may be profound in severe congestive heart failure and is often associated with cardiac glycoside intoxication. It may be a major symptom in patients with uremia, pulmonary failure, and various endocrinopathies (e.g., hyperparathyroidism, Addison's disease, and panhypopituitarism). Anorexia also often accompanies psychogenic disturbances, such as anxiety or depression.

NAUSEA AND VOMITING Nausea and vomiting may occur independently of each other, but generally they are so closely allied that they may conveniently be considered together *Nausea* denotes the feeling of the imminent desire to vomit, usually referred to the throat or epigastrium. *Vomiting* refers to the forceful oral expulsion of gastric contents; *retching* denotes the labored rhythmic respiratory activity that frequently precedes emesis. Extremely forceful *projectile vomiting* is a special form of vomiting which has significance because it connotes the presence of increased intracranial pressure.

Nausea often precedes or accompanies vomiting. It is usually associated with diminished functional activity of the stomach and alterations of the motility of the duodenum and small intestine. Accompanying severe nausea there is often evidence of altered autonomic (especially parasympathetic) activity: pallor of the skin, increased perspiration, salivation, and the occasional association of hypotension and bradycardia (vaso-vagal syndrome). Anorexia is also often present.

Following a period of nausea and a brief interval of retching, a sequence of involuntary visceral and somatic motor events occurs, resulting in emesis. The stomach plays a relatively passive role in the vomiting process, the major ejection force being provided by the abdominal musculature. With relaxation of the gastric fundus and gastroesophageal sphincter a sharp increase in intraabdominal pressure is brought about *by* forceful contraction of the diaphragm and abdominal wall. This together with concomitant annular contraction of the gastric pylorus, results in the expulsion of gastric contents into the esophagus. Increased intrathoracic pressure results in the further movement of esophageal contents into the mouth. Reversal of the normal direction of esophageal peristalsis may play a role in this process. Reflex elevation of the soft palate during the vomiting act prevents the entry of the material into the nasopharynx, whereas reflex closure of the glottis and inhibition of respiration help to prevent pulmonary aspiration.

Repeated emesis may have deleterious effects in a number of different ways. The process of vomiting itself may lead to traumatic rupture or tearing in the region of the cardioesophageal junction, resulting in massive hematemesis, the Mallory-Weiss syndrome. Prolonged vomiting may lead to dehydration and the loss of gastric secretions (especially hydrochloric acid), resulting in metabolic alkalosis with hypokalemia. Finally, in states of central nervous system depression (coma, etc.), gastric contents may be aspirated into the lungs, with a resulting aspiration pneumonitis.

Clinical classification Nausea and vomiting are common manifestations of organic and functional disorders. The precise mechanisms triggering vomiting in the various clinical states are poorly understood, making classification of mechanisms difficult. The categories mentioned below serve to illustrate some of the many disorders which may be accompanied by nausea and vomiting.

Many *acute abdominal emergencies* which lead to the "surgical abdomen" are associated with nausea and vomiting. Notably, vomiting may be seen with inflammation of a viscus as in acute appendicitis or acute cholecystitis, obstruction of the intestine, or acute peritonitis.

In many of the disorders involving *chronic indigestion* nausea and vomiting may be prominent. Emesis may *be either* spontaneous or self-induced and may lead to relief of symptoms, as for example, in uncomplicated peptic ulcer. Nausea and vomiting may accompany the distention and pain seen in the aerophagic syndromes. Often in patients with chronic indigestion, nausea and vomiting may be provoked by specific foods *(e.g.,* fatty foods), for reasons that are poorly understood.

Acute systemic infections with fever, especially in young children, are frequently accompanied by vomiting and often by severe diarrhea. The mechanism whereby infections remote from the gastrointestinal tract produce these manifestations is unclear. Viral, bacterial, and parasitic infections of the intestinal tract may be associated with severe nausea and vomiting, often with diarrhea. Severe nausea and vomiting may be prominent in viral hepatitis, even before the appearance of jaundice.

Central nervous system disorders which lead to increased intracranial pressure may be accompanied by vomiting, often projectile. Brain swelling due to inflammation, anoxemia, acute hydrocephalus, neoplasms, etc., may thus be complicated by vomiting. Disorders of the labyrinthine apparatus and its central connections which underlie vertigo may be accompanied by vomiting with nausea and retching. Acute labyrinthitis and Meniere's disease are examples of such disturbances. Migraine headaches, tabetic crises, and acute meningitis are additional examples of disorders of the nervous system which may lead to vomiting. In the reactive phase of hypotension with syncope, there may also be nausea and vomiting.

Severe nausea and vomiting may be present in *acute myocardial infarction,* especially of the posterior wall of the heart. Nausea and vomiting may also be seen in *congestive heart failure,* perhaps in relation to congestion of the liver. The possibility that these symptoms may be due to drugs (e.g., opiates or digitalis) should always be borne in mind in patients with cardiac disease.

Nausea and vomiting commonly accompany several *endocrinologic disorders,* including diabetic acidosis and adrenal insufficiency, especially adrenal crises. The morning sickness of early pregnancy is another instance of nausea and vomiting possibly related to hormonal changes.

The *side effects of many drugs and chemicals* include nausea and vomiting. In some instances this is because of gastric irritation which stimulates the medullary vomiting center.

Psychogenic vomiting means vomiting which may occur as part of any emotional upset on a transitory basis or more persistently as part of a psychic disturbance. Close observation will usually disclose the condition to be one of regurgitation rather than of vomiting, and weight loss may not correspond at all to the patient's description of the frequency and severity of vomiting. Anorexia nervosa is an emotional disturbance which may be associated not only with anorexia but also with vomiting. Often patients with emotional disorders and vomiting maintain a relatively normal state of nutrition because a relatively small amount of the ingested food is vomited.

CHEMICAL INTERVENTION

The chemical substances administered for medical purposes include not only drugs but also vaccines, hormones, anesthetics and even foods. All such measures lend themselves to use, abuse and misuse

A medical student asks: "Why is it that most of the drugs we prescribe are destroyed in the liver? How could nature have designed the liver to destroy drugs manufactured by man millions of years later?" The answer lies in the still dimly perceived universe of chemical reactions embodied in all living organisms. In those organisms that eat, food must be turned into the chemicals of life. The liver plays a key role in this extraordinary performance. Most of the blood that leaves the stomach and the intestines must pass through the liver before reaching the rest of the body. The liver is thus strategically placed to process nutrients and to detoxify poisons that might be ingested with the food.

It is therefore not surprising that when a chemist manufactures a drug, which somehow must alter the chemistry of the patient, the general structure of the new chemical has already been anticipated by the liver. The chemical structure of a refined drug is often similar to a naturally occurring substance. For example, alkaloids such as opium, from which heroin is derived, flourished in poppy plants that preceded man on the earth. Detoxification of such chemicals in the liver can be regarded as one of the developments that enabled the species to survive". In the Garden of Eden the liver must have protected Adam from alkaloids, if not from the apple.

This relation between drugs and the liver illustrates two general aspects of man's chemical intervention in his own physiology. The first aspect is that life itself is an awe-inspiring multitude of natural chemical reactions. Sir Macfarlane Burnet put it succinctly: "It is very humbling to realize that there is more information packed into the head of one spermatozoon than there is in all the volumes of the *Journal of Biochemistry."* The second aspect is that when man deliberately alters these

reactions, whether through chemicals derived from nature or through those manufactured by man in imitation of nature, there is a simultaneous potential for healing and for injury, sometimes for life or for death.

It is small wonder, then, that in man's ancient and even recent efforts at chemical intervention the health benefits have been far outweighed by chemical mayhem. In past centuries harmful agents were often prescribed by physicians (a little arsenic as a tonic) or imbibed unwittingly (lead in the wine goblets and cooking utensils of ancient Rome). Destruction has been and still is sought out recklessly by some in opium or heroin addiction. Oliver Wendell Holmes was largely correct when he observed that "if all the drugs in the pharmacopoeia save three were dumped into the ocean, it would be so much the better for our patients and so much the worse for the fish." At the beginning of the 20th century there were only about six reliable and effective pharmaceutical preparations, namely digitalis (still helpful in many kinds of heart disease), morphine, quinine (for malaria), diphtheria antitoxin, aspirin and ether. Two other successful means of chemical intervention were also available: immunization against smallpox and rabies. This pharmacopoeia remained basically unchanged until about die time of World War II. Since then drugs and other substances that can, if employed wisely, usefully affect the chemistry of life have been produced in startling numbers.

The food we eat provides the chemicals the body needs to continue functioning. Much remains to be learned about what constitutes an optimal diet. Except where food intake is affected by peculiar food customs, by poverty, by social upheavals such as war, by drug addiction, by alcoholism or by some other illness, the nutrition of man today is generally much better than it was at any time in the past. It is difficult otherwise to explain the increased stature of people of many nations.

This is not to say that we now have the best diet possible. Most of us in the U.S. and in many other countries eat too much. The. ideal amounts of animal fats, vegetable fats, proteins, carbohydrates, roughage, vitamins and minerals in the diet are still matters for investigation and debate. Even with our limited knowledge, however, physicians are able to prescribe special diets that are clearly beneficial for people with certain inborn errors of metabolism. For example, sprue is an illness that often causes diarrhea and malnutrition because of poor absorption of food in the small intestine. The inborn error in sprue has not yet been discovered, but it is known that patients with sprue are intolerant of gluten, a sticky protein found in wheat and some other foods. As long as gluten is consumed, patients subject to sprue suffer from the symptoms of the disease. The delicately fringed microscopic lining of the small intestine becomes peculiarly blunted and inefficient. Good health can almost always be restored simply by omitting gluten from the diet.

Lactose, the sugar found in milk, is not itself absorbed in the bloodstream. Its molecule is first cleaved in the small intestine into the smaller molecules of glucose and galactose, two sugars that can be readily absorbed. The cleavage of lactose into glucose and galactose is accomplished by an enzyme called lactase. After infancy some people develop a deficiency of lactase. When a person with a lactase deficiency drinks a large amount of milk, diarrhea and various kinds of abdominal discomfort often ensue. The remedy is a diet that does not contain lactose. Intolerance for lactose is an inherited metabolic trait.

Sprue and lactase deficiency illustrate a small number of conditions in which a specific diet constitutes effective chemical intervention. In some other illnesses, probably also of genetic origin, certain diets can provide partial or occasional relief. For example, there is one kind of diabetes (characterized by the excretion of glucose into the urine) that appears in people who are too fat. This diabetes is greatly ameliorated by a diet low enough in calories to ensure an optimal weight.

A number of diets that are of no proved value at all are widely publicized and sold. For example, some diets are said to be therapeutic for various mental illnesses, but there is no proof that this is so. Others are based, mistakenly but profitably, on the notion that low blood sugar (hypoglycemia) 'is a very common ailment and aim to correct it even when it is not present. There are individuals who do show various types of periodic lowering of the blood-sugar concentration, but these illnesses are not common and should be diagnosed and treated only by a physician. In fact, if any unusual diet is embarked on, it should only be on a physician's advice.

The ready availability of pure vitamins has made it possible to halt many diseases that are caused by the absence of certain vitamins in the diet or by the inability to absorb them. Pernicious anemia, which was once invariably fatal, can now be managed with infrequent and inexpensive injections of vitamin B-12. Vitamins are often taken unnecessarily. Vitamin C prevents or cures scurvy, once a lethal disease of sailors and others long-removed from fresh fruits and vegetables, but there is no convincing evidence that it cures or prevents colds. Fortunately it is harmless, even in large doses, as are the B vitamins. Vitamins A and D, on the other hand, are poisonous in very large doses.

With some exceptions, tampering with ordinary nutritional habits is not beneficial. Nearly everyone with an adequate diet thrives, in spite of wide variations in what normal people eat. This is in striking contrast to the difficulties that may be encountered when, because of illness or accident or surgery, a patient cannot eat and must be nourished intravenously. Depending on the conditions, the problem may be relatively simple. For example, a patient who is otherwise well nourished and healthy but who cannot eat for a few days after surgery may require only appropriately sterile and optimal concentrations of glucose and salt.

The situation is quite different when the patient has extensive bowel disease and must be nourished intravenously for two months. A host of problems, some of them well understood and others poorly, confront the physician. He must worry about the concentration of such elements as sodium, potassium, calcium, magnesium and phosphorus. He must devise ways of infusing adequate amounts of protein or of amino acids, the molecules of which protein is made. Intravenous protein is expensive and carries with it some risks. Constant infusions require exceedingly careful techniques to avoid inflammation of the veins and serious infections. In spite of such difficulties chemical intervention to provide complete nutrition by intravenous feeding has been accomplished and is a monumental achievement.

GENETIC ASPECTS 0F DISEASE

GENETIC PRINCIPLES More than one-fifth of the proteins (and hence genes) in each human being exist in a form that differs from the one present the majority of the population. This remarkable genetic variability, or polymorphism, among "normal" people accounts for much of the naturally occurring variation in body traits such as height, intelligence, and blood pressure. Moreover, these genetic differences cause variability in the ability of individuals to handle every environmental challenge, including those that produce disease. Thus, human disease can be conlered to occur as a result of an interaction between an individual's genetic makeup and the environment. In certain diseases, however, the genetic component is so overwhelming that expresses itself in a predictable manner without a requirement for extraordinary environmental challenges. Such diseases are termed *genetic disorders.*

MOLECULAR BASIS OF GENE EXPRESSION All hereditary information is transmitted from parent to offspring through the inheritance of specific molecules of deoxyribonucleic acid DNA). DNA is a linear polymer composed of pyrine and py-ridine bases whose sequence ultimately determines the sequence of amino acids in every protein molecule made by the body. The four types of bases in DNA are arranged in groups three, each group forming a code word, or codon, that signifies a particular amino acid. A *gene* represents the total sequence of bases in DNA that specifies the amino acid sequence with a single polypeptide chain of a protein molecule. Genetic information encoded in the DNA of the chromosomes is first transcribed into a *ribonucleic acid* (RNA) copy. During transcription the ribose nucleotides align themselves ng the DNA according to base-pairing rules. Thus, adenine DNA pairs with uridine of RNA, cytosine pairs with gua, thyrnine pairs with adenine, and guanine pairs with cytose. The ribose bases are joined together by RNA polymerase. The resulting *RNA transcript* forms the template for transla into the amino acid sequence of a protein. The DNA of many genes is fragmented into discrete coding regions (exons) separated by noncoding regions (introns or intervening sequences). The *coding regions* contain the information specifying the sequence of amino acids in the polypeptide chain. The *intervening sequences* are composed of sequences of bases that act as spacers between the coding regions; they are not translated into protein. The transcription of DNA produces a faithful copy of the entire gene sequence; thus, the RNA transcript contains a mosaic of coding and intervening sequences. The RNA transcript is edited in the nucleus before it passes into the cytoplasm. In the editing process, the intervening sequences are excised and the coding regions are spliced together to form One continuous gene.

After processing, the edited RNA, which is called *messenger RNA* (mRNA) leaves the nucleus and enters the cytoplasm where it becomes associated with *ribosomes* and thereby serves as a template for the ribosomal synthesis of proteins. Each of the 20 precursor amino acids for protein synthesis is attached in the cell cytoplasm to specify molecules called *transfer RNA* (tRNA). Each tRNA contains a sequence of purine and pyrimidine bases that is "complementary" to a specify codon in the mRNA. These tRNA molecules with their attached amino acids line up along the mRNA molecule in the precise order dictated by the mRNA code. Under the action of a variety of cytoplasmic enzymes (initiation factors, elongation factors, and termination factors), peptide bonds are formed between the various amino acids, and the completed protein is released from the ribosome.

MAINTENANCE OF GENETIC DIVERSITY THROUGH TRANSMISSION AND SEGREGATION OF GENES It is estimated that the amount of DNA in the nucleus of each human cell is sufficient to code for more than 100,000 genes and hence to specify more than 100,000 polypeptide chains. The genes are arranged in a linear sequence of DNA that together with certain histone proteins form rod-shaped bodies called *chromosomes.* Each somatic cell contains 46 chromosomes, arranged in 23 pairs, one of each pair derived from each of the individual's parents. Thus, each individual inherits two copies of each chromosome and hence two copies of each gene. The chromosomal location of the two copies of each gene is termed the *genetic locus.* When a gene occupying a genetic locus exists in two or more diffйrent forms, these alternate forms of the gene are referred to as *alleles.*

In humans, a given gene always rйsides at a specified genetic locus on one particular chromosome. For example, the genetic locus for the Rh blood group is on the short arm of chromosome 1; at this chromosomal site there are two Rh genes, one on chromosome I derived from the mother and the other on chromosome 1 derived from the father. When two genes at the same genetic locus are identical, the individual is a homozygote. When the two genes differ (i.e., two alleles are present at the locus), the individual is a heterozygote. Each normal human is heterozygous at approximately 20 percent of genetic loci and homozygous at 80 percent.

The genetic information carried on chromosomes is transmitted to daughter cells under two diffйrent sets of circumstances. One of these occurs whenever a somatic cell (i.e., a nongerm cell) divides. This process called mitosis, functions to transmit identical copies of each gene to each daughter cell, thus maintaining a uniform genetic makeup in ail cells of a single individual. The other set of circumstances prevails when genetic information is to be transmitted from one individual to an offspring. This process, called meiosis, functions to produce germ cells (i.e., ova or spermatozoa) that possess only one copy of each parental chromosome, thus allowing for new combinations of chromosomes to occur when ovum and sperm cell fuse during fertilization.

During the process of meiosis, the 46 chromosomes of an immature germ cell arrange themselves in 23 pairs at the center of the nucleus, each pair being composed of one chromosome derived from the mother and its homologous chromosome derived from the father. At a specified point in the meiotic process, the two partner chromosomes separate, only one of each pair going into each daughter cell, or gamete. Thus, meiosis produces gametes with a reduction in the number of chromosomes from 46 to 23, each game having received one chromosome from each of the 23 pairs. The assortment of Chromosomes within each pair is random so that each cell receives a different combination of maternal and paternal chromosomes. During the process of fertilization, the fusion of ovum and sperm cell, each of which has 23 chromosomes, results ultimately in an individual with 46 chromosomes.

The independent assortment of chromosomes into gametes during meiosis produces an enormous diversity among the possible genotypes of the progeny. For each 23 pairs of chromosomes, there are 2^{23} different combinations of chromosomes

that could occur in a gamete, and the likelihood that one set of parents will produce two offspring with the identical complement of chromosomes is one in 2^{23}or one in 8,4 million (assuming no monozygotic or identical twins).

RECOMBINATION Adding to the genetic diversity in humans is the phenomenon of *genetic recombination.* During meiosis, when homologous chromosomes are paired, bridges frequently from between corresponding regions of the chromosome pair. These bridges, or *chiasmata* are regions in which the two chromosomes break at identical points along their length and subsequently rejoin, the distal segments having been switched from one homologous chromosome to another. This process is designated *crossing over.* Although no net change in the amount of genetic material occurs during crossing over, a recombination of genes does occur. For example, consider a chromosome with two loci A and B, located at opposite ends of the same chromosome.

CELLS AND AGING

Frederic Verzar, the Swiss dean of gerontologists, once said: "Old age is not an illness; it is a continuation of life with decreasing capacities for adaptation." Only recently has his view of aging as a progressive failure of the body's homeoslatic adaptive responses gained wide acceptance. There has been a strong tendency to confuse aging with many diseases frequently associated with it especially cancer and atherosclerosis. Each, in fact, probably accelerates the other.

The obvious characteristics of aging arc well known: graying and loss of hair, loss of teeth, wrinkling of skin, decreased muscle mass, and increased fat deposits. The physiological signs of aging are gradual deterioration in function and capacity to respond to environmental stress. Thus, basic kidney and digestive metabolic rates decrease, as does the ability to maintain a constant internal environment despite changes in temperature, diet, and oxygen supply. These manifestations of aging are related to a decrease in the actual number of cells in the body (100,000 brain cells are lost each day) and to the disordered functioning of the cells that remain.

The extracellular components of tissues also change with age. *Collagen* fibers, responsible for the strength of tendons, increase in number and change in quality with aging. These changes in arterial walls are as much responsible for the loss of elasticity as those in arteriosclerosis. *Elastin,* another constituent of the intercellular matrix, is responsible for the elasticity of blood vessels and skin. It thickens, fragments, and acquires a greater affinity for calcium with age changes that may be associated with the development of arteriosclerosis.

Several kinds of cells in the body heart cells, skeletal muscle cells, neurons are incapable of replication. Experiments have proved that many other cell types are limited when it comes to cell divisions. Embryonic fibro-blast cells grown outside the body divided only 50 times and then stopped. Other experiments showed that the number of divisions correlated with the donor's age. The finite lifetime of cultured human cells has been observed in many other normal cell types including skin, brain, liver, and smooth muscle. No exception has been found to the general rule that normal cells possess a finite capacity to divide. The number of divisions also correlated with the normal life span to the different species from which the cells were obtained strong evidence for the hypothesis that cessation of mitosis is a normal, genetically programmed event.

Just as the factors that limit the life of an individual cell are unknown, so are those that restrict the growth or life of a tissue or organ. At menopause the ovary ceases to function. Certain ovarian cells die long before the rest of the female body. Perhaps similar mechanisms determine longevity.

Some investigators have studied aging from the standpoint of immunology. The ability to develop antibodies is said to diminish with age. Senescence, according to researchers, results in the older person's immunological system having a "shotgun," rather than a specific, response to foreign protein. This shotgun response may include an autoimmune reaction that attacks and gradually destroys the individual's own normal tissue and organs.

AGING HUPOTHESES

Most gerontologists believe that aging is a manifestation of the genetic coding within the cells of an organism. A logical extension of the concept of development that begins from the moment of conception, aging must be part of the ongoing genetic expression of events that guides us through embryological and fetal development, through childhood changes, adolescence, and maturity. Three general hypotheses are used as a basis for additional research.

The first hypothesis proposes that, as time passes, the information-processing apparatus of cells begins to make more and more errors. As a result, faulty enzymes would lead to a decline in the functional capability of the cells. Experiments designed to study protein synthesis in aging cells have not produced evidence that supports this hypothesis.

The second hypothesis proposes that many of the genes along the DNA molecule are repeated in identical sequences, making the genetic message very redundant. When an active gene is damaged, it is replaced by another of the copies. Thus, as a person lives, the copies are gradually used up, errors accumulate, and functional losses result. Therefore, the greater the redundancy, the greater the life span.

The third hypothesis proposes that aging is a continuation of a normal sequence of genetic signals that regulate development. This hypothesis suggests that "aging genes" are activated in the proper sequence, which causes a slowing down of biochemical pathways that are expressed in the recognizable changes of aging.

Two cell lines are known to escape from the inevitability of aging or death. These are germ cells and cancer cells. Perhaps these cell lines share a common genetic mechanism that makes them immortal. Fertilization is a process that resets or reprograms a cell's clock by reshuffling genetic information. Viruses can invade a cell's DNA and reshuffle the DNA to reset the clock within the cell. These mechanisms make it certain that each member of a species is programmed to die but they ensure that the species will survive.

CANCER

Any cell capable of mitotic division can undergo neoplastic transformation. Thus, cancers can only arise from those tissues that have active stem cells or cells that can revert to an active mitotic stale, such as liver hepatocytes or the small lymphocytes. Cancers cannot arise from irreversible postmitotic cells of cardiac or skeletal muscle or neuronal tissue.

Cancer invariably starts with a single cell that undergoes a transformation and then produces a clonal expansion forming a tumor mass. Since all the cells are clones of the original transformed cells, these cells also are clonogenic and they can also divide indefinitely. Thus, a neoplastic clone becomes immortal.

The molecular mechanisms that can trigger the change in the initial cell are very diverse. Several pathways that could produce the neoplastic transformation have been described. Some of these produce genetic alterations within the cell. Others seem to reactivate silenced genes that were important during earlier development. Somatic mutations alter the genome by giving rise to deletions or rearrangements of the nuclear DNA. Some viruses induce tumors when they insert themselves into the cellular DNA and thus introduce new additional "genetic" information that leads to the altered behavior.

When normal cells change into neoplastic cells, they develop a very "antisocial" behavior toward the normal cells. Malignant cells characteristically invade adjoining tissues and grow into otherwise inappropriate locations. They grow rapidly and in irregular patterns. The most devastating feature of their behavior is their ability to disassociate themselves from the proliferating mass and enter the lymphatic or blood systems. When such cancer cells find an appropriate location, they invade the new territory and form a secondary site of tumor growth.

CONSEQUENCES OF NEOPLASMS

Neoplasms can affect the host in many ways. Benign growths do not invade the surrounding tissue nor do they metastasize and so their effects are restricted m their site of origin. They can elicit very dangerous responses, or their effects can be trivial. For example, a small strictly benign tumor in the subcutaneous tissue of the arm in could pose a cosmetic problem but probably very little else. On the other hand, a perfectly benign tumor can actually kill the host if it grows in a vital region such as the brain. There, a benign tumor could, by virtue of its increasing size, exert pressure and crush some vital center. Therefore, while the word benign may imply a kind or generous attitude, benign tumors should be carefully examined; they are not inconsequential. Benign tumors of endocrine glands can result in uncontrollably high levels of the circulating hormone with disastrous effects. Benign tumors can be surgically removed, thus eliminating any disease.

Malignant neoplasms (cancers) can not also duplicate the effects of benign tumors but they act more aggressively and cause more destruction because they grow at a much faster rate. Their effects are widespread because of their metastatic activity. The rapidly growing cells compete nutritionally with the normal cells. Thus, frequently, patients with advanced cancer appear malnourished. The advanced cancer patient dies from an episode of pneumonia or systemic sepsis.

Malignant tumors are treated in a variety of ways and often in a combination of ways. Curative therapy involves surgery to remove the neoplasm, irradiation, and chemotherapy. In some research hospitals immunotherapy employing monoclonal antibodies is being studied.

AN APPROACH TO INFECTIOUS DISEASES

THE SCOPE OF INFECTIOUS DISEASES The vast majority of human and animal diseases of known etiology are produced by biologic agents: viruses, rickettsias, bacteria, mycoplasma, Chlamydia, fungi, protozoa, or nematodes. No small part of the past and present importance of infectious diseases in medical practice is attributable to their enormous frequency and the public health implications of their contagiousness. However, developments in sanitary engineering, vector control, immunization, and specific chemotherapy have modified the situation favorably. Although important exceptions remain infectious diseases as a class are more easily prevented and more easily cured than any other major group of disorders. Despite the elimination of some infectious diseases such as smallpox and the profound reduction in the morbidity and mortality rates of many, humans are by no means free of infection. In fact, the total human load of disease produced by microbial parasites has decreased only modestly, primarily through smallpox and malaria control and better health care in developing countries. As certain specific microbial infections have been controlled, others have emerged as troublesome therapeutic and epidemiologic problems. With the introduction of cytotoxic drugs, massive irradiation in the treatment of malignant diseases, and immunosuppressive agents to control the rejection of transplanted organs, the insertion of prosthetic devices into the bloodstream, and the progressive longevity of people with chronic degenerative diseases, infections due to organisms previously considered saprophytic or commensal have increased. These infections have also been termed opportunistic. As Dubos has pointed out, microbial infections appear to form an inherent part of human life.

Because of better environmental sanitation and other measures that now prevent contact with many microbial agents, and the development of acquired immunity early in childhood, certain infections have been seen more frequently in adults. For example, as contact with poliomyelitis virus in childhood declined in many countries, paralytic poliomyelitis became more common in young adults. Hemophilus influenzae meningitis and pneumonia is being reported more frequently in adults than heretofore, and decreasing infection with the tubercle bacillus raises questions about the status of antituberculous immunity in adults. For reasons that are not clear, hepatitis A is predominantly a disease of young adults, while non - A, non-B hepatitis tends to occur in individuals over 35 years of age. As antimicrobial agents reduce the mortality associated with certain common infections, other microbes emerge as important causes of human disease. If an infection occurs during or immediately following a course of chemotherapy, it is often caused by a microorganism that is resistant to the drug that was given; such an infection is termed a superinfection. While it is relatively unusual nowadays for patients to die of uncomplicated pneumococcal pneumonia, a disease readily handled with available antimicrobials, it is common to see serious disease produced by microorganisms which are much more resistant even though they are often part of the normal microbial flora in humans. These include staphylococci, gram-negative enteric bacilli, and a variety of anaerobes and fungi. One important mechanism by which resistance is conferred on gram-negative enteric bacteria is the action of R factors.

THE PARASITE AND THE HOST. The interaction between microorganism and humans that results in infection and disease is complex. Much has been learned about the way in which microbes enter the body, the ways in which they produce tissue injury, the influence of specific immunity and "nonspecific" resistance of the host, and the mechanisms of recovery. It is not yet possible to transfer in any specific way much of the information that has been acquired to the individual patient with an infection. However, considerable progress is being made. Examples are the sexual transmission of hepatitis A virus; the major role that Chlamydia are found to play in the causation of pelvic inflammatory disease; the role of Norwalk and rotaviruses in infectious diarrheas; and advances in antimicrobial therapy in containing heretofore difficult-to-treat bacteria .

INFECTION AND CLINICAL DISEASE. It is well known that microorganisms of different species or different strains of the same species vary widely in their capacity to produce disease and that human beings are not equally susceptible to the disease caused by a given bacterium or virus. Furthermore, while a specific infectious disease will not occur in the absence of the causative organism, the mere presence of the organism in the body does not lead invariably to clinical illness. Indeed, the production of symptoms in humans by many parasites is the exception rather than the rule, and the *subclinical infection* or the "carrier» state" is the usual host-parasite relationship. *Disease* in a clinical sense is not synonymous with the presence of the organism or injection in a microbiological sense. In fact, for most organisms the number of subclinical infections far exceeds that of clinical disease.

MECHANISMS OF INJURY. It is customary to refer to bacteria or other microorganisms that are capable of producing disease as *pathogenic*. *Virulence*, the degree of pathogenicity, should be distinguished from invasiveness, the ability to spread and disseminate in the body. For example, *Clostridium tetani* is pathogenic and, by virtue of its exotoxin, highly virulent, but it is almost completely lacking in invasiveness. Moreover, in certain circumstances and in certain anatomic locations, mildly "pathogenic" organisms can produce fatal disease, or highly "pathogenic" species can multiply without producing any harmful effect.

A few microorganisms produce toxins that account for the tissue damage and physiological alterations of infection. *Hypersensitivity* to components of the organism is demonstrable in several infections to account for the manifestations of disease. For many pathogenic agents, an explanation of their damaging effects upon the host is incomplete or wholly lacking. Generally, therefore, the aim of therapy is to stop multiplication or to kill the microorganisms with appropriate drugs: in diseases caused by toxin-producing organisms, the use of antitoxin (as in tetanus or diphtheria) is the definitive procedure, and chemotherapy is of secondary importance. A relatively new example of a toxin-mediated infection is the toxic shock syndrome, in which the toxin is elaborated by S.aureus. In this situation, this ordinarily invasive organism does not usually invade local tissues.

The tendency of certain pathogenic organisms *to localize in certain cells or organs* and to produce disease in a specific anatomic site or evoke a combination of symptoms referable to certain organs often suggests the identity of the causative organism. For example, the pneumococcus usually causes infection in the lung, but almost never in the kidney, and *H.influenzae* infections are confined almost solely to the respiratory tract and meninges. Similarly, in the presence of disease known to be caused by a given agent, involvement of other tissues can be anticipated or predicted. Examples include the multiple lung abscesses which are so characteristic of hematogenously disseminated staphylococcal disease and the metastatic skin lesions which complicate Pseudomonas bacteremia.

RESISTANCE AND SUSCEPTIBILITY. Many so-called host factors are known to influence the likelihood that disease will occur if organisms enter the tissues, or to play a determining role in the outcome once the infection has become established. These include natural or acquired antibodies, interferon, properdin, phagocytic activity, and the level of the inflammatory response, which is generally manifested by cellular activity such as chemotaxis, phagocytosis, and release of lysozomal enzymes.

In experimental animals, sex, microbial strain, age, route of infection, the presence of specific antibody, associated diseases, nutritional state, and the use of such procedures as exposure to ionizing radiation or high environmental temperature or administration of mucin, antimetabolites, adrenal steroids, epinephrine, and metabolic analogues can be shown to exert a profound effect on infection by bacteria, viruses, fungi, and other agents.

In humans, these factors are no less important, although controlled studies are lacking for many. Alcoholism; diabetes; deficiency or absence of immunoglobulins; defects in cellular immunity; malnutrition; chronic administration of steroid hormones, chronic lymphedema; ischemia; the presence of foreign bodies such as bullets, calculi, or bone fragments; obstruction of a bronchus, the urethra, or any hollow tube; agranulocytosis or congenital defects in bactericidal or virucidal activity; various blood dyscrasias, and many other circumstances influence susceptibility to systemic or local infection. Furthermore, in those instances where the extenuating condition is remediable, the probability of recovery is enhanced.

PRINCIPLES OF NEOPLASIA: APPROACH TO DIAGNOSIS AND MANAGEMENT

Physicians practicing internal medicine should be familiar with the various implications of the diagnosis of cancer in their patients. Cancer is not one disease. There are more than 100 clinically distinct forms of cancer, with differing biological behavior and clinical manifestations. The internist should be especially familiar with the natural history and treatment of common forms of malignancy, such as those of the breast, lung, and gastrointestinal tract. These epithelial cancers comprise over 50 percent of the cancers usually encountered. The magnitude of the cancer problem may be appreciated by a few statistics: one of four Americans will develop cancer during his or her lifetime, and over 420,000 Americans will die of cancer in 1983. Not only is cancer a major health problem, but the management and care of cancer patients is often complex.

With the development of medical oncology as a subspecialty of internal medicine, the internist is playing an ever-increasing role in the care of the cancer patient.

The diagnosis and management of cancer require knowledge of general internal medicine and an understanding of the characteristics of the growth and spread of malignant neoplasms. For example, a nodular lesion in the lung must be evaluated for the possibility of neoplastic as well as granulomatous disease. Intermittent rectal bleeding must be appraised for benign or malignant neoplasms as well as for inflammatory bowel disease. Cushing's syndrome requires evaluation for bilateral adrenal hyperplasia as well as for an oat-cell carcinoma of the lung capable of producing adrenocorticotropic hormone (ACTH).

This chapter presents an overview of the biology and etiology of neoplasia and summarizes an approach to the diagnosis, staging, and treatment of cancer. The pathophysiologic changes occurring as a consequence of the tumor as a local mass, as a result of metastases, or from the elaboration of various substances by tumor are discussed.

BIOLOGY OF NEOPLASIA

Cancer is a term used to characterize abnormal growth of cells which may result in the invasion of normal tissues or the spread to distant organs, termed *metastasis.* The degree of malignancy of a cancer is based upon the propensity of these cells for invasion and distant spread. A metastasis is a neoplastic lesion arising from another cancer, with which it is no longer in contiguity. Regardless of mechanism, separation of malignant cells from the primary cancer is an essential part of the neoplaslic process. The basic concept that metastases arise directly from the constituent cells of primary cancer originates from observations of histologic similarities between the two. The mode of transport of cells from the primary to the presumptive secondary lesions is inferred from the many observations of cancer cells infiltrating tissues and invading blood vessels and lymphatic channels, and the recognition of circulating cancer cells in the blood of patients with cancer. However, many of the presumed circulating cancer cells have been determined to be megakaryocytes. In addition, the possibility that "metastases" could arise from the release of oncogenic viruses from the primary lesion requires further evaluation.

CYTOGENETICS

The characteristics of a particular tumor cell are, in general, permanent and stable and are inherited by descendants of that tumor cell. These characteristics may be explained best by structural alterations of the DNA in genes or chromosomes. These genetic structural changes may range from single gene mutations to gross chromosomal changes. These chromosomal changes may involve loss or gain of chromosomes, translocation of chromosomes, and changes in ploidy. Although the DNA and chromosomes of tumor cells may be clearly different from those of normal cells, the changes are not uniform from tumor to tumor, and no abnormality in the genetic material may be detectable in a substantial number of human tumors. Various techniques are available to analyze the DNA of normal and tumor cells, including the methods of nucleic acid hybridization. This technique allows comparison of analogous nucleotide chains from different cells by analyzing the product of each chain when allowed to interact. With use of radioactive RNA or DNA, comparable sequences of nucleotide chains from different cells can be quantified. Reverse transcriptase (RNA-directed DNA polymerase) has been used to synthesize isotope-labeled DNAs. These DNA templates have been used to show homologies, between murine leukemia virus and human leukemias and sarcomas, supporting the hypothesis of a viral etiology of human leukemia.

The most widely used technique for gross examination of genetic material is the examination of metaphase chromosomes. A tumor may be characterized by its "modal" karyotype, i.e. the number of chromosomes and the morphologic pattern of the largest percentage of cells. Major advances in cytogenetics have resulted from development of techniques to demonstrate chromosome banding, utilizing fluorescent acridine dyes, or by treatment of chromosomes by heat, alkali, or enzymes prior to staining. This permits accurate identification of individual chromosomes and regions within the chromosome, increasing the sensitivity of chromosome examination.

Only a few neoplastic diseases in humans are associated with a specific and characteristic chromosome abnormality; these include chronic myelogenous leukemia (CML), acute promyelocytic leukemia (APL), some lymphoproliferative disorders, and meningioma. In about 85 percent of the patients with CML, the material comprising approximately half of the long arm of a G22 chromosome is translocated to the end of a C9 chromosome. This abnormality (Philadelphia chromosome, Ph^1) involves all three hematopoietic cell lines, and has been interpreted as an acquired somatic cell mutation in the bone marrow, with preferential survival and proliferation of this clone. In APL, the material from the distal part of the long arm of an E17 chromosome is translocated to the end of a DI5 chromosome. This abnormality is present in approximately two-thirds of the patients with APL. In the lymphoproliferative disorders, an 8/14 translocation has been associated with most Burkitt's lymphomas and a marker I4q + has been found in the tumors of many patients with multiple myeloma, Hodgkin's disease, and non-Hodgkin's lymphomas. The chromosome abnormality associated with meningioma is hypodiploid in contrast to the examples cited above, and frequently involves the deletion of chromosome G22.

Approximately 50 percent of patients with acute leukemia have detectable cytogenetic abnormalities. Although the abnormalities are not necessarily uniform, they are probably nonrandom. For any given patient they tend to remain characteristic and recur during a clinical relapse. Leukemias induced by radiation, drugs, *or* both such as occur in some patients with treated Hodgkin's disease, have a much higher percentage of chromosomal abnormalities. The use of chromosome-banding techniques may result in grouping of patients with common etiologies or prognoses. Cytogenetic studies also may occasionally be useful in the diagnosis of "preleukemia" when abnormal karyotypes are present.

For technical reasons, only a limited number of chromosome studies have been performed in solid tumors. Cytogenetic abnormalities are frequent and major in solid tumors such as melanoma, lung cancer, and colon cancer. Significant aneu-ploidy is present in almost all tumors. In melanoma the variation from cell to cell is substantial and has been interpreted as evidence for multiple cell lines, cytogenetic instability, and rapid clonal evolution toward more malignant behavior.

ETIOLOGY

Although the etiology of cancer, in humans cannot yet be explained at the molecular level, it is clear that genetic composition of the host is important in cancer induction. Related immunologic factors may predispose the host to a putative

carcinogen. There is some evidence that viruses may play a role in the neoplastic process. In addition, both environmental and therapeutic agents have been identified as carcinogens.

INFLUENZA

DEFINITION

Influenza is an acute respiratory infection of specific viral etiology characterized by sudden onset of headache, myalgia, fever, and prostration. The terms *influenza* and "flu" should be restricted to those cases with clear-cut epidemiologic or laboratory evidence of infection with influenza viruses.

HISTORY

According to the best available records, influenza was uncommon in Europe during the nineteenth century until the pandemic of 1889. Subsequently, the frequency and severity of epidemics increased, culminating in the disastrous pandemic of 1918, which caused an estimated 20 to 40 million deaths. The mortality rate from the disease has decreased progressively since 1918 owing in part to the introduction of antibiotics and also to such factors as possible change in virulence of the virus and improved living standards.

ETIOLOGY

There are three distinct antigenic types of influenza virus, designated A, B, and C. Infection with one type confers no immunity to the other two. On the basis of intrinsic properties, the three types are grouped in a virus family named Orthomyxoviridae. The influenza viruses contain a single, segmented, negative-strand RNA genome. They are spherical or filamentous enveloped particles, 80 to 120 nm in diameter, with glycoprotein structures termed *hemagglutinin (H)* and *neuraminidase (N),* which protrude from the envelope. The former are responsible for attachment of virus to cell receptors; the latter enzymatically degrades the active receptor substance, frees virus from attachment sites if cell penetration is unsuccessful, and functions in the release of infectious virus from cells during the replication cycle. The H and N are antigenic and elicit antibodies which correlate with the prevention of infection and disease. Antihemagglutinin antibodies are more potent than those elicited by the N antigen.

The three types of influenza viruses are biologically related by their infectivity for chick embryos, capacity to agglutinate erythrocytes in vitro, and affinity for respiratory epithelium of various mammals.

EPIDEMIOLOGY

Influenza A. Influenza A viruses are the cause of outbreaks of disease almost annually and reach epidemic proportions every 2 or 3 years. Pandemics occur every decade or so.

Influenza, especially type and infection, is a recurring disease, because the virus undergoes continuous antigenic variation with time, involving the surface antigens H and N. This progressive, but not necessarily regular, change produces viruses to which segments of the population become susceptible in numbers somewhat in proportion to the extent of antigenic variation. Thus the annual interepidemic outbreaks are not as severe nor as extensive as the less frequent epidemics. The origin of pandemic viruses is unknown, but they appear to arise by a different mechanism. The segmented genome of type A influenza virus exhibits a high recombination frequency. Consequently, a recombinational event between human and non-human type A influenza viruses, or between two human type A viruses in the same host, could possibly give rise to antigenically different subtypes.

It was also noted that many older people did not become ill during the 1968 epidemic, and it was found that many of them possessed antibody to this subtype that was probably acquired in the period 1889 to 1890, when the subtype then prevalent shared antigenic properties with the 1968 subtype. There is also evidence that the 1957 virus shared antigens with the subtype that was prevalent before 1890, although owing to the time lapse there were too few older people with antibody to have a measurable effect on the pandemic.

Variants within subtypes are identified by the site of first isolation of the new strain and the year of its isolation. Differentiation among variants is important because vaccines to one variant show a progressive loss of protective effect against later emerging variants, so that after about 3 years the vaccine will have little effect.

Influenza A viruses infect pigs, horses, and fowl especially ducks and turkeys. H and N antigens of some of these viruses are related to H and N antigens of human influenza A viruses. The internal matrix protein of the virus is an antigen common to all influenza A viruses. The name *swine influenza* was given to the agent that caused the 1918 pandemic because an epidemic of influenza that occurred among swine at that time was thought possibly to have spread to swine from infected people. The swine agent has continued to infect swine populations since that time. The pandemic A (H3N2) strain of 1968 shared antigens with an agent isolated from horses in 1963. Despite these findings and considerable experimentation with induction of infection across species lines, there is no solid evidence that lower animals are involved in the natural history of human influenza.

Influenza A epidemics start abruptly, reach a peak in 2 to 3 months, and subside almost as rapidly. The attack rate is variable but was noted in 1957 to exceed 50 percent in urban populations. An additional 25 percent of individuals may show serologic evidence of infection without clinical manifestations. Experiences in 1957 proved conclusively that crowding, even in summer months or in tropical countries, is a major factor predisposing to epidemics. Schoolchildren, in particular, appear to be the primary focus and disseminators of infection in the United States. If the general immunity of a population is at low levels, community-wide epidemics may occur within a short period after the introduction of new strains of virus. If, however, immune individuals predominate, the case rate will rise slowly and may not reach epidemic proportions.

The mortality rate from all causes always increases markedly during epidemics of influenza. In the fall and winter of 1957 to 1958 it was estimated that 40 million persons in the United States became ill with influenza, and the total number of influenza-associated deaths was reported to be in excess of 8000. In addition, approximately 60,000 more deaths from various causes occurred during this period than would be expected under normal conditions. The greatest incidence of excessive mortality occurred among infants under 1 year of age and adults over 60 years of age. Data from a small series of cases clearly indicate that influenza is frequently fatal in individuals with preexisting pulmonary or cardiac disease, regardless of age. Chronic rheumatic heart disease with mitral stenosis, in particular, appears to predispose to fatal influenza pneumonia.

Influenza B and C

Influenza B virus infection occurs sporadically or in localized outbreaks, particularly in schools and military camps and every 4 to 6 years causes more discrete epidemics than influenza A. Although influenza B virus possesses H and N coal proteins, it undergoes less variation than influenza A viruses, and it is not now the practice to designate the virus by these antigens. Illness with influenza B infection is less serious than that caused by influenza A viruses. The most serious problem with influenza B infections is a complication. Reye's syndrome, characterized by encephalopathy and fatty changes in the liver and other organs. Illness with influenza C is rarely detected, although antibody surveys indicate a wide prevalence of the infection.

PATHOGENESIS

Influenza is primarily an infection of the respiratory epithelium that is produced by inoculation with virus from respiratory secretions of infected persons. Experimental studies show that a small number of virus particles inhaled in a small-particle aerosol or severalfold larger doses in liquid suspension dropped in the nose will produce the disease. Infection thus could result from transfer of infected secretions by personal contact or fomites or, probably much more frequently, by inhalation of aerosols generated by sneezes, coughs, and other expiratory discharges of infected individuals.

After inoculation, the virus multiplies to maximum titers in a few days. Cells lining the respiratory tract, including ciliated epithelium, alveolar cells, mucous gland cells, and macrophages may become infected. Neutrophil leukocytes and endothelial cells do not appear to become infected. Evidence of virus infection by specific immunofluorescence is most conspicuous in cells that show fewest morphologic changes. Infected ciliated cells undergo degeneration after a day or so and are characterized by swelling of nuclei with shift from a longitudinal to a transverse position in the cell. Cytoplasmic changes are granulation, vacuolation, and swelling. Ultimately cells become necrotic and slough, in some areas to be replaced by flattened and metaplastic epithelial regrowth.

THE HISTORY OF GENETICS

What is Genetics? Genetics is usually defined as the transmission of traits from one generation to the next. Although correct in its meaning, the definition is rather vague. Genetics not only involves the transmission of traits from generation to generation, but it also involves every biological occurrence in an organism. The history of genetics beginning with the ideas of Aristotle up till the re-discovery of Mendel's work has undergone many changes both in theory and discovery.

The history of Genetics most often begins with the ideas of Aristotle and Hippocrates. Their basic belief on Genetics included the determination of sex and inheritance of disease based upon the idea of Spontaneous Generation. They believed that sex of the offspring depended upon which testes produced the semen that fertilized the egg. Through this, Darwin later labeled the theory Pangenesis. Darwin believed that gremmules were manufactured by every part of our body, which then collected in the semen producing the basis of heredity. This theory was Darwin's defense for the theory of Acquired Characteristics. Although Pangenesis was believed by most people, Aristotle came to the conclusion that characteristics weren't inherited, but the ability of producing these characteristics were.

Another theory that was proposed during this time was Preformation. Preformation stated that entire miniature individuals lived in the germ cells and matured in the womb of the female. It was unknown during this time how traits were passed on so scientist concluded that somehow aspects of the parents' bodies were transferred in miniature individuals known as homunculus. As we entered the 18^{th} and 19^{th} century the improvement of the microscope helped disprove the Theories of Spontaneous Generation and Preformation. With this, the question of how traits were inherited was still unknown.

Gregor Mendel, better known as the Father of Genetics, was the first scientist to show traits had a predictable pattern. He had succeeded were many others failed by luckily choosing simple and unchanging traits. The seven traits Mendel chose were 1. Difference in form of the ripe seed 2, Difference in color of seed endosperm 3, Difference in color of seed coat 4, Difference if form of ripe pods 5, Difference in colors of unripe pods 6, Difference in position of the flowers and 7, Difference in length of stem. With these different characteristics Mendel made thousands of different crosses in the garden pea, and established that indeed there was a pattern of transmission of traits. Resulting from his studies was the Law of Segregation and the Law of Independent Assortment. After completion of his eight years of investigation, Mendel presented his work before the Science Research Society. The significance of his work wasn't realized until 1900 when his work was re-discovered.

Three years after Mendel had completed his work; a German scientist by the name of Friedrich Miescher discovered nuclein. Miescher believed that this substance was storage for phosphorus rather than genetic material. During this time it was believed that protein was the basis of heredity because it was so complex. They didn't believe DNA wasn't the hereditary factor because it was so simple and easily understood. Miescher's discovery wasn't realized as an importance until 889 with the development of August Weismans Germ Plasm Theory. The Germ Plasm Theory suggested that each chromosome remained in tact from generation to generation and it was passed on by the germ cell. He also concluded that each chromosome contains all hereditary elements to produce an individual. In other words the chromosomes were responsible for the transportation of hereditary material. The Germ Plasm Theory gave rise to the Chromosome Theory of E.B. Wilson. Wilson's chromosome Theory stated that chromatin is very similar to nuclein and that inheritance might be effected by the transmission of chemical

compounds from parent to offspring. Without realizing it Wilson was talking of genes. Both the Germ Plasm Theory and Chromosome Theory explained nuclein as DNA and DNA as genes by which transmit heredity.

Walter S. Sutton developed his own theory and it suggested that chromosomal pairs were equally important as the segregating pair of gene alleles. Correns and Hugo De Vries assisted Sutton's Chromosome Theory. Correns assumed there were different orders of alleles that allowed for recombination. Sutton then ran into a problem with his theory when he noticed there weren't enough chromosomes to identify each gene in a whole chromosome. Hugo de Vries proposed that sometimes those genes were possibly exchanged freely during meiosis. With this developed the Theory of Crossing Over.

The phenomenon of crossing over is the exchange of genetic material between two or four chromatids of a tetrad during synapsis. These chromatids join at a point called the chiasmata, and it is there were segments of chromatids are exchanged. It is important to know that crossing over can occur a multiple number of times per tetrad. Crossing over plays a major role in the reassortment of alleles into different recombinations, which leads to genetic diversity. If it weren't for crossing over all chromosomes would remain the same except for and occasional mutation. After the crossing over process one can no longer distinguish between maternal and paternal chromosomes since the DNA is now combined. This solution showed that Independent Assortment wasn't as regular as a flip of a coin. The discovery of linkage eventually resolved this difficulty.

Correns first reported linkage. He crossed strains of stocks in which one had anthocyanin in the petals and seeds and had hoary leaves and stems; while the other had white flowers and seeds, and smooth leaves and stems. After the cross, Correns failed to recover any recombinations and believed only in complete linkage. Bateson on the other hand was the first to report incomplete linkage. He crossed two gene pairs involved in distinguishing purple flowers from red ones and long pollen grains from small ones. The two situations that arose were 1. Two dominates were contributed by the same parent and 2. One dominant and one recessive gene came from each parent. The result of this made the estimation of the recombination of genes very difficult and imperfect. With the discovery of linkage, de Vries Theory of Crossing Over was proven to be correct.

The first suggestion of a particular characteristic to a particular chromosome was made in 1901. C.E. McClung believed the *X* chromosome was the male determining factor. He came to this conclusion by counting 22 *X* chromosomes in the female and 23 X chromosomes in the male. Since the male retained one more X chromosome than the female, he believed it to be the main factor in the determination of sex. McClung's assumption turned out to be incorrect. In 1905 N.M. Stevens showed the correct relationship to be as followed. The presence of *XX* chromosomes showed clearly to be a female and the combination of the XY chromosomes resulted in a male. (Sturtevant 41) Through further studies, the most important element was shown to be that *Y* bearing sperm produced male offspring and X bearing sperm produced female offspring. In 1922, through the work of *Drosophilia melanogaster*, Bridges discovered many different sexes. He uncovered the supermale, superfemale and the intersex. In the example below, it is important to know the X autosome is female determinant and *the A* autosome is male determinant. The supermale is produced by the fusion of an *X+A+A* egg with a sperm not carrying an X autosome forming an *X, 3A* zygote. A problem discovered in the supermale was that it was sterile. An X+X+A egg fertilized with a X+A sperm forms the superfemales. This *3X, 2A* zygote than runs into problems. They are delayed in their development and rarely able to survive. In the intersex form, the individual is neither male nor female, but a mixture of both. The formation consists of an *X+A+A* egg with normal *X+A* sperm to form a *2X, 3A* zygote. Through studies on the intersex form it was decided each character of an individual is effected by an unknown number of genes which change development from one direction to the opposite.

Another important factor in the study of genetics is continuous variation. Galton discussed this in his Law of Ancestral Inheritance. It correlated the resemblance between parent and offspring. As discussed in H.J. Muller's Variation Due to Change in Individual Gene, there were thousands of genes that played an important role in determining cell substance and cell structure. Galton's Law of Inheritance is an alternate interpretation due to Mendel's principle of random breeding. Galton also discussed the idea of "Nature vs. Nurture," but a scientist by the name of W. Johannsen applied the meaning behind the idea. Through his work Johannsen, was able to distinguish between inherited and environmentally produced traits. He came to the conclusion that inherited variation were minute in their appearance while environmentally produced variations were large. The introduction of environmentally produced variation developed another method of studying the inheritance of characteristics by selection. Most of the effects of selection are due to the sorting out and build up of modifying genes. These genes then produced characteristics of an organism to help them become more adapted. This adaptation implies the expressed variation due to changes in individual genes or better known as mutation. By this, it was determined that selection works on genes already present in the organism. The understanding of how selection operates has become very important in applying genetics to the problems of evolution. Thus evolution isn't caused by inheritance and variation, but by the inheritance of variation. Muller introduced another method by which he believed genes affected characteristics. It suggested there was some connection between chromosome behavior and gene structure, but he insured us that it was only a possibility.

MICROBIOLOGY AND MEDICINE

Applications of microbiology have given medicine its greatest successes in the diagnosis, prevention and cure of disease. The conquest of epidemic and fatal infections has seemed to be so conclusive that the main challenge in medicine is now often seen to lie in other fields, such as those of the mental illnesses and degenerative diseases, but a major shift of attention away from the problems of infection could be dangerous. The relative freedom of society from fatal infections depends on the continued, informed deployment of complex counter- measures: on correct diagnosis and treatment of infections, full implementation of immunization programmes, alert epidemiological surveillance and rigorous environmental sanitation.

Moreover, on a global scale, infection is far from defeated. In the developing nations of the world, an estimated 10 million people (predominantly young children) die each year from the effects of infectious diarrhoeas, measles, malaria,

tetanus, diphtheria and whooping cough alone. The tragedy is that we have the means to hand to prevent nearly all these deaths.

Even in the developed world infective illnesses are still extremely common and make up much of the work of family and hospital doctors. At least quarters of all illness for which patients consult their doctors are infective, and a substantial proportion of patients acquire infection while in hospital. Intensive farming methods and a shift in eating habits to pre-prepared 'fast foods' have led to a sharp increase in food-related infection. In hospitals, new approaches to therapy that deplete the competence of the patient's immune system to cope with infection, as well as the increasing use of shunts, intravenous cannulae and prosthetic devices, all provide the ever-resourceful microbes with new opportunities .to invade the host. Surprisingly, 'new' agents of infectious disease continue to be recognized. The most notorious of these is undoubtedly the human immunodeficiency virus (HIV), the causative agent of acquired immune deficiency syndrome (AIDS). The rise and spread of this condition provides a sobering reminder of the potential impact of microbial disease. It is as essential now as it ever was that medical personnel should be well trained in matters relating to infection.

Microbiology is the study of living organisms of microscopic size. The term was introduced by the French chemist Louis Pasteur, whose demonstration that fermentation was caused by the growth of bacteria and yeasts (1857-60) provided a main impetus for the development of the science. The term *microbe* was first used by Sedillot in 1878, but is now commonly replaced by that of *micro-organism.* The microbes of medical interest include *protozoa,* the smallest animals, *fungi,* including moulds and yeasts, *bacteria,* which have much smaller, simpler cells, and *viruses,* the smallest and simplest of all. Most viruses are less than 0.2 micrometres (μm) in diameter and so are not resolvable with the light microscope. Because they lack a cellular structure and can replicate only within a living host cell, viruses are sometimes regarded as components of their host rather than as micro-organisms, but since they are organized bodies, capable of reproducing themselves in different hosts, and of surviving outside their hosts, it is justifiable as well as convenient to classify them as micro-organisms. Although *helminths* (parasitic worms) are macroscopic, they cause infection and their study falls within the province of microbiologists. Students should, therefore, be familiar with their properties.

DEVELOPMENT OF MICROBIOLOGY

Micro-organisms were first seen about 1675 by the Dutchman Antony van Leeuwenhoek. His microscopes consisted of a single biconvex lens that magnified about x 200 and resolved bodies with diameters down to about 1 μm. He found many micro-organisms in materials such as water, mud, saliva and the intestinal contents of healthy subjects, and he recognized them as living creatures ('animalcules') because they swam about actively. That he saw bacteria as well as the larger microbes is known from his measurements of their size ('one-sixth the diameter of a red blood corpuscle') and his drawings of the forms we now recognize as cocci (spheres), bacilli (rods) and spirochaetes (spiral filaments).

Leeuwenhoek observed that very large numbers of bacteria appeared in watery infusions of animal or vegetable matter which were left to stand for a week or two at room temperature. He believed that these huge populations were the progeny of a few parental organisms, or seeds that were originally present in the materials of the infusion or had entered it from the air. Other scientists suggested that the organisms arose by *spontaneous generation,* i.e. by the spontaneous conversion of dead organic matter into living microbes, and this suggestion began a controversy that lasted for 200 years. The necessary techniques were perfected only after much further work, particularly that by Lazzaro Spallanzani (1765, 1776) and Louis Pasteur (1860-64). Pasteur's flasks of infusions, sterilized by autoclaving at 115-120°C, always remained sterile despite the entry of unheated air through a dust-stopping 'swan neck' or cotton-wool stopper, and so finally proved the absence of spontaneous generation.

Although this conclusion was long delayed, the work on spontaneous generation had the valuable outcome of establishing many of the basic techniques of bacteriology. Convenient nutrient media for preparing growths, or *cultures,* of bacteria in the laboratory were derived from Leeuwenhoek's meat and vegetable infusions, and reliable methods were developed for the sterilization and maintenance of sterility of culture media and equipment. The mechanism of bacterial reproduction by asexual fission was discovered by De Saussure (1760) and the need for high temperatures for sterilization was explained by Ferdinand Cohn's (1876) discovery that certain bacteria form heat-resistant spores. Other techniques essential for the rapid progress of bacteriology were developed by the German bacteriologist Robert Koch, who in 1877 described methods for the easy microscopic examination of bacteria in dried, fixed films stained with aniline dyes, and in 1881 devised the simple method for isolating pure *cultures* of bacteria by plating out mixed material on a solid culture medium on which the progeny of single bacteria grow in separate colonies.

MICRO-ORGANISMS AND DISEASE

Only a small proportion of the micro-organisms that abound in nature are disease-producing, or *pathogenic,* for man. Most are *free-living* in soil, water and similar habitats, and are unable to invade the living body. Some free-living micro-organisms obtain their energy from daylight or by the oxidation of inorganic matter, but the majority feed on dead organic matter and is termed *saprophytes.* In contrast, a *parasite* lives in or on, and obtains its nourishment from, a living host. In medical usage, the term 'parasite' is nowadays usually reserved for parasitic protozoa, helminths and arthropods. The last usually affect the outside of the body and are termed *ectoparasites. Commensal* micro-organisms constitute the normal flora of the healthy body. They live on the skin and on the mucous membranes of the upper respiratory tract, intestines and vagina, and obtain nourishment from the secretions and food residues. Since normally they do not invade the blood or tissues, they are generally harmless, but under certain circumstances, as when the' body's defences are impaired, they may invade the tissues and cause disease, thus acting as *opportunistic pathogens.* True pathogens are the micro-organisms that are adapted to overcoming the normal defences of the body and invading the tissues; their growth in the tissues, *or* their production of poisonous substances *(toxins),* damages the tissues and causes the manifestations of disease. The process of microbial invasion

of the body is called *infection,* and a microbial disease is often called an *infective disease.* Those infective diseases that are readily communicable from person to person are called *infectious* or *contagious.*

IMMUNITY AND IMMUNIZATION

It was an ancient observation, reported for instance by Fracastoro, that persons who had suffered from a distinctive disease, such as smallpox or measles, resisted it on subsequent exposures and rarely contracted it a second time. Such an acquired immunity is *specific,* i.e. effective only against the same type of infection as that previously suffered (or, exceptionally, a closely related one, as when cowpox immunizes against smallpox).

LABORATORY DIAGNOSIS OF INFECTIONS

The signs and symptoms of some infective diseases may be specific for a particular micro-organism, e.g. the circumscribed boil of the staphylococcus and the characteristic rash of chickenpox, but those of many infections are unspecific, and any of several different pathogenic organisms may be the cause of an illness such as sore throat, bronchitis, pneumonia, meningitis, diarrhoea, wound sepsis and fever. In these cases, laboratory help is required to elucidate the cause. The reliability of that help depends on the correct techniques being used in collecting the appropriate specimens from the patient, and doctors must be properly instructed in these procedures. The precise identification of the patient's pathogenic organisms is generally necessary for the effective use of a selective chemotherapeutic drug. In other words, the doctor has to identify and treat specific infections rather than clinical syndromes. Since, moreover, different strains of many bacterial species differ in their susceptibility to particular drugs, it is usually desirable for the bacterium isolated from the patient to be tested for its drug sensitivity in the laboratory.

EPIDEMIOLOGY AND THE PREVENTION OF INFECTION

A knowledge of the sources, mechanisms of transmission and predisposing conditions of an infection makes it possible to devise preventive measures such as neutralization of the sources, interference with the mechanisms of transmission and removal of the predisposing conditions. Microbiology is thus closely concerned with *epidemiology,* which is the study of the factors that influence the prevalence and distribution of diseases in the community. The reporting of laboratory diagnoses of specific communicable infections to the health officer concerned with preventive measures plays an important part in guiding his day-to-day activities, and the collection of records of laboratory findings helps to guide national policies for immunization and environmental hygiene.

Sources of infection are the habitats in which the pathogenic microbes ordinarily grow and from which they are disseminated to susceptible hosts. Inanimate objects which carry the pathogens through the environment in a surviving, but non-growing, condition are known as *vehicles* of infection. Many species of pathogens are derived exclusively or mainly from *ill patients* as their source, but many others grow in, and are disseminated from, healthy persons, known as *carriers,* in whom they cause only a limited, subclinical infection. The existence of carriers was first demonstrated about 1900 in studies of typhoid fever initiated by Koch, and their importance as sources of infection is due to their mobility and lack of recognition in the community. Some infections, called *zoonoses,* have their sources in animals, which are the natural hosts of the pathogen, e.g. rabies, bubonic plague, brucellosis and leptospirosis. They are transmissible from animal to man, but not ordinarily from man to man, so that prevention depends on the control of human contact with the infected animals. As well as these kinds of *exogenous* infections from external sources, there are also many infections, termed *endogenous,* which are due to the opportunistic invasion of tissues by a commensal, or 'carried', organism that hitherto grew harmlessly elsewhere in the body, e.g. infections of the lung with pneumococci previously resident in the throat. The prevention of endogenous infections depends on the avoidance of predisposing conditions that impair the tissue defences.

Epidemiological observations may suggest by what mechanisms an infection is transmitted and so lead to the formulation of preventive measures even when the causal micro-organism is still unknown. In 1846, for instance, in a maternity clinic in Vienna, Ignaz Semmelweis deduced that puerperal fever was caused by a putrefactive agent which doctors picked up on their hands when attending patients or performing necropsies and then transferred into the birth canal when assisting women at childbirth. He reduced the number of deaths from 8.3 to 2.3% of mothers by requiring staff regularly to wash their hands in hypochlorite solution until they were free from the smell of putrefaction.

In comparable work, the anaesthetist John Snow (1849, 1854) showed that the geographical distribution of cholera in London was related to the sources of the supplies of drinking water, and concluded that the 'peculiar poison of the disease' was spread in patients' faeces, which contaminated water later drunk by other persons (faecal-oral transmission). Measures subsequently taken to ensure the purity of drinking water by protection, filtration and chlorination have led to the decline of cholera, typhoid fever and other water-borne infections.

The development of the techniques of antiseptic and aseptic surgery for the prevention of wound sepsis had its origin in the conception by Joseph Lister (1867) that if, as shown by Pasteur, bacteria were the cause of the fermentation and putrefaction of dead organic matter, they might well also be the cause of suppuration in living tissues. By covering operation wounds with dressings soaked in carbolic acid to kill any bacteria present in them and to exclude others from entry, and by disinfecting his hands and instruments, he greatly reduced the incidence of sepsis in his patients.

The discovery that blood-sucking arthropods spread certain diseases led to prevention by measures for the control of these vectors. In 1893 Theobald Smith and F. L. Kilborne first showed that Texas fever of cattle was spread by ticks that bite an infected cow and transmit its blood to another animal. Subsequently, it was shown that malaria was transmitted by anopheles mosquitoes (Ronald Ross, 1898), yellow fever by aedes mosquitoes (Reed and co-workers, 1900). bubonic plague by the rat flea (Liston and co-workers, 1905) and typhus fever by lice (Charles Nicolle, 1909). Campaigns of vector control by the use of insecticides and other means have since been conducted for the prevention of these diseases.

Although infective illness has remained common during the last 100 years, developed countries have seen a phenomenal decrease in the death rate from infections. In Scotland, deaths from the principal infectious diseases contributed, at a rate of 1167 per 100 000 of the population per annum, more than a half of all deaths, in the quinquennium 1861-65, whereas in 1961-65 they were reduced to the rate of 111 per 100 000 and contributed only one-tenth of all deaths (see Fig. 1.1). A similar decline in deaths from infectious disease occurred in England and Wales and predated the availability of effective chemotherapy. Since the steep decline in deaths began more than a century before preventive and curative medicine became significantly effective, the earlier reduction in deaths must have been due to improvements in nutrition and living conditions which increased the resistance of individuals to the point that they generally recovered from their many infections. Subsequently, and particularly with the introduction of immunization programmes and antimicrobial therapy in the last 50 years, medicine has made a more substantial contribution to the saving of life.

HEADACHE

The term *headache* should encompass all aches and pains located in the head, but in common language its application is restricted to unpleasant sensations in the region of the cranial vault.

Headache, along with fatigue, hunger, and thirst, represents the most frequent human discomforts. Medically speaking, its significance is often abstruse, for it may stand as a symptomatic expression of disease or of some minor tension or fatigue, incident to the affairs of the day. Fortunately, in most instances it reflects the latter, and only exceptionally does it warn of serious disease seated in intracranial structures. But it is this dual significance, the benign and the potentially malignant, that keeps the physician on the alert. Systematic approach to the headache problem necessitates a broad knowledge of the medical and" surgical diseases of which it is a symptom and a clinical methodology which leaves none of the common and treatable causes unexplored.

GENERAL CONSIDERATIONS

In the introductory chapter on pain, reference was made to the necessity, when dealing with any painful state, of determining its quality, location, duration, and time course, and conditions, which produce, exacerbate, or relieve it. When headache is considered in these terms, a certain amount of useful information is obtained by careful history, but perhaps less than one might expect. Unfortunately, physical examination of the head itself is seldom useful.

As to quality of cephalic pain, the patient is rarely helpful in describing it. In fact persistent questioning on that point occasions surprise, for the patient usually assumes that the word *headache* should have conveyed enough information to the examiner about the nature of the discomfort. Most headaches are dull, deeply located, and of aching character, a pain recognizable as of the type that usually arises from structures deep to the skin. Seldom is there reported the superficial burning, smarting, or stinging type of pain localized to the skin. When asked to analogize the sensation to another sensory experience, the patient may make some allusion to tightness, pressure, or bursting feeling, terms which then give clue to a muscular tension or a psychologic state.

Queries about the intensity of the pain are seldom of much value since they reflect more the patient's attitude toward the condition and a customary way of reporting things that happen than the true severity. As usual the bluff, hearty person tends to minimize discomfort, whereas the neurotic dramatizes it. Degree of incapacity is a better index. A severe migraine attack seldom allows performance of the day's work. The pain, which awakens the patient from sleep at night, or prevents sleep, is also more likely to have a demonstrable organic basis. As a rule, the most intense cranial pains are those that accompany subarachnoid hemorrhage and meningitis, which have grave implications, or migraine and paroxysmal nocturnal orbitotemporal (cluster) headaches, which are benign.

Data regarding *location* of the headache are apt to be more informative. If the source is in deep structures (extracranial, i.e., subdermal, or muscular), as is usually the case, the correspondence with the site of the pain is fairly precise. Inflammation of an extracranial artery causes pain well localized to the site of the vessel. Lesions of paranasal sinuses, teeth, eyes, and upper cervical vertebrae induce less sharply localized pain but one that is still referred in a regional distribution that is fairly constant. Intracranial lesions in the posterior fossa cause pain in the occipital-nuchal region, homolateral if the lesion is one - sided. Supratentorial lesions induce frontotemporal pains, again homolateral to the lesion if it is on one side. But localization can also be very uninformative or misleading. Ear pain, for example, although it may mean disease in the ear, more often is referred from other regions, and eye pain may be referred from parts as remote as the occiput or cervical spine.

Duration and *time-intensity* curve of headaches in both the attack itself and their life profile are most useful. Of course the headache of bacterial meningitis or subarachnoid hemorrhage occurs usually in single attacks over a period of days. Single, brief, momentary (1 to 2 s) pains in the cranium are presently uninterpretable and are significant only because they indicate no serious underlying disease. Migraine of the classic type has its onset in the early morning hours or daytime, reaches its peak of severity in a half hour or so, lasts, unless treated, for several hours up to 1 to 2 days, and is often terminated by sleep. In the life history a frequency of more than a single attack every few weeks is exceptional. A migraine patient having several attacks per week usually proves to have a combination of migraine and tension headaches. In contrast to this is the nightly occurrence (2 to 3 h after onset of sleep) over a period of several weeks to months of the rapidly peaking, nonthrobbing orbital or supraorbital pain of cluster headache, which tends to dissipate within an hour. The headache of intracranial tumor characteristically can occur at any time of day or night, can interrupt sleep, varies in intensity, and lasts a few minutes to hours. The life profile is one of increasing frequency and intensity over a period of months. Tension headache, once commenced, may persist continuously for weeks or months, though waxing and waning from hour to hour. Headache that bears a more or less constant relationship to certain biologic events and also to physical environmental changes may prove to be informative. Premenstrual headaches most typically relate to premenstrual tension during the period of oliguria and edema formation; they usually vanish after the first day of vaginal bleeding. The headaches of cervical arthritis are most typically intense after a period of inactivity,

and the first movements in the morning are both difficult and painful. Hypertensive headaches, like those of cerebral tumor, tend to occur on waking in the morning, but, as with all vascular head aches, excitement and tension may provoke them. Headache
from infection of nasal sinuses may appear, with clocklike regularity, upon awakening and in midmorning, and is characteristically worsened by stooping and jarring of the head. Eyestrain headaches naturally follow prolonged use of the eyes, as in reading, peering for a long time against glaring headlights in traffic, or watching the cinema. Atmospheric cold may evoke pain in the so-called fibrositic or nodular headache or when the underlying condition is arthritic or neuralgic. Anger, excite
ment, or irritation may initiate common migraine in certain disposed persons; this is more typical of common migraine than of the classic type. Change of position, stooping, straining, cough, and sexual intercourse are each known to produce a special type of headache, to be described further on. Exertional headaches, another well - known type, are usually benign (only 1 in 10 will have an intracranial lesion) and disappear within weeks to months.

PAIN - SENSITIVE STRUCTURES AND MECHANISMS OF HEADACHE

Understanding of headache has been greatly augmented by the observations of surgeons during operations. They inform us that the following cranial structures are sensitive to mechanical stimulation: (1) skin, subcutaneous tissue, muscles, arteries, and periosteum of skull; (2) delicate structures of eye, ear, and nasal cavity; (3) intracranial venous sinuses and their tributary veins; (4) parts of the dura at the base of the brain and the arteries within the dura mater and piaarachnoid; and (5) the trigeminal, glossopharyngeal, vagus, and first three cervical nerves. The bony skull much of the piaarachnoid and dura and the parenchyma of the brain lack sensitivity. Interestingly, pain is practically the only sensation produced by stimulation of the listed structures.

The pathways whereby sensory stimuli, whatever their source, are conveyed to the central nervous system are the trigeminal nerves for structures above the tentorium in the anterior and middle fossae of the skull, and the first three cervical nerves for those in the posterior fossa and infradural structures. The ninth and tenth cranial nerves supply part of the posterior fossa and refer the pain to the ear and throat. The tentorium is the border zone between the trigeminal and cervical innervation.

The pain of intracranial disease is referred, by a mechanism already discussed, to some part of the cranium lying within the areas supplied by the aforementioned nerves (the fifth, ninth, and tenth cranial nerves and the first three cervicals). There may be an associated local tenderness of the scalp at the site of reference. Dental or jaw pain may also have cranial reference. The pain of disease in other parts of the body is not referred to the head, although it may initiate headache by other means.

PHARMACY

Pharmacy is the science and technique of preparing and dispensing drugs. It is a health profession that links health sciences with chemical sciences and aims to ensure the safe and effective use of pharmaceutical drugs.

The scope of pharmacy practice includes more traditional roles such as compounding and dispensing medications, and it also includes more modern services related to health care, including clinical services, reviewing medications for safety and efficacy, and providing drug information. Pharmacists, therefore, are the experts on drug therapy and are the primary health professionals who optimize use of medication for the benefit of the patients.

An establishment in which pharmacy (in the first sense) is practiced is called a pharmacy (this term is more common in the United States) or a chemist's (which is more common in Great Britain). In the United States and Canada, drugstores commonly sell drugs, as well as miscellaneous items such as confectionery, cosmetics, office supplies, and magazines and occasionally refreshments and groceries.

The word *pharmacy* is derived from its root word *pharma* which was a term used since the 15th–17th centuries. However, the original Greek roots from *pharmakos* imply sorcery or even poison. In addition to pharma responsibilities, the pharma offered general medical advice and a range of services that are now performed solely by other specialist practitioners, such as surgery and midwifery. The pharma (as it was referred to) often operated through a retail shop which, in addition to ingredients for medicines, sold tobacco and patent medicines. Often the place that did this was called an apothecary and several languages have this as the dominant term, though their practices are more akin to a modern pharmacy, in English the term apothecary would today be seen as outdated or only approproriate if herbal remedies were on offer to a large extent. The pharmas also used many other herbs not listed. The Greek word *Pharmakeia* (Greek: φαρμακεία) derives from *pharmakon* (φάρμακον), meaning "drug", "medicine" (or "poison").

In its investigation of herbal and chemical ingredients, the work of the pharma may be regarded as a precursor of the modern sciences of chemistry and pharmacology, prior to the formulation of the scientific method.

MATTER

Before the 20th century, the term **matter** included **ordinary matter** composed of atoms and excluded other energy phenomena such as light or sound. This concept of matter may be generalized from atoms to include any objects having mass even when at rest, but this is ill-defined because an object's mass can arise from its (possibly massless) constituents' motion and interaction energies. Thus, matter does not have a universal definition, nor is it a fundamental concept in physics today. Matter is also used loosely as a general term for the substance that makes up all observable physical objects.

All the objects from everyday life that we can bump into, touch or squeeze are composed of atoms. This atomic matter is in turn made up of interacting subatomic particles—usually a nucleus of protons and neutrons, and a cloud of orbiting electrons. Typically, science considers these composite particles matter because they have both rest mass and volume. By

contrast, massless particles, such as photons, are not considered matter, because they have neither rest mass nor volume. However, not all particles with rest mass have a classical volume, since fundamental particles such as quarks and leptons (sometimes equated with matter) are considered "point particles" with no effective size or volume. Nevertheless, quarks and leptons together make up "ordinary matter", and their interactions contribute to the effective volume of the composite particles that make up ordinary matter.

Matter commonly exists in four *states* (or *phases*): solid, liquid and gas, and plasma. However, advances in experimental techniques have revealed other previously theoretical phases, such as Bose–Einstein condensates and fermionic condensates. A focus on an elementary-particle view of matter also leads to new phases of matter, such as the quark–gluon plasma. For much of the history of the natural sciences people have contemplated the exact nature of matter. The idea that matter was built of discrete building blocks, the so-called *particulate theory of matter*, was first put forward by the Greek philosophers Leucippus (~490 BC) and Democritus (~470–380 BC).

Matter should not be confused with mass, as the two are not quite the same in modern physics. For example, mass is a conserved quantity, which means that its value is unchanging through time, within closed systems. However, matter is *not* conserved in such systems, although this is not obvious in ordinary conditions on Earth, where matter is approximately conserved. Still, special relativity shows that matter may disappear by conversion into energy, even inside closed systems, and it can also be created from energy, within such systems. However, because *mass* (like energy) can neither be created nor destroyed, the quantity of mass and the quantity of energy remain the same during a transformation of matter (which represents a certain amount of energy) into non-material (i.e., non-matter) energy. This is also true in the reverse transformation of energy into matter.

Different fields of science use the term matter in different, and sometimes incompatible, ways. Some of these ways are based on loose historical meanings, from a time when there was no reason to distinguish mass and matter. As such, there is no single universally agreed scientific meaning of the word "matter". Scientifically, the term "mass" is well-defined, but "matter" is not. Sometimes in the field of physics "matter" is simply equated with particles that exhibit rest mass (i.e., that cannot travel at the speed of light), such as quarks and leptons. However, in both physics and chemistry, matter exhibits both wave-like and particle-like properties, the so-called wave–particle duality.

CYTOLOGY

Cytology, more commonly known as *cell biology*, studies cell structure, cell composition, and the interaction of cells with other cells and the larger environment in which they exist. The term "cytology" can also refer to *cytopathology*, which analyzes cell structure to diagnose disease. Microscopic and molecular studies of cells can focus on either multi-celled or single-celled organisms.

That fact that we as humans are made up of millions of tiny cells, and that other lifeforms around us are similarly constituted, now barely needs explanation. The concept of the cell is relatively new, however. The scientific community did not accept the idea of the existence of cells until the late 18th century.

Recognizing the similarities and differences of cells is of the utmost importance in cytology. Microscopic examination can help identify different types of cells. Looking at the molecules which form a cell, sometimes called molecular biology, helps in further description and identification. All fields of biology depend on the understanding of cellular structure. The field of genetics exists because we understand cell structure and components.

Another important aspect in the discipline of cytology is examining cell interaction. By studying how cells relate to other cells or to the environment, cytologists can predict problems or examine environmental dangers to cells, such as toxic or cancer-causing substances. In humans and other multi-cellular structures, cytology can examine the presence of too many of one kind of cell, or the lack of enough of a certain kind of cell. In a simple test like a complete blood count, a laboratory can look at white blood cells and identify the presence of an infection, or it may examine a low level of certain types of red blood cells and diagnose anemia.

Certain autoimmune disorders can be diagnosed by abnormal cell reactions. Hashimoto's thyroiditis, for example, is an autoimmune condition caused by abnormal cell reaction. Instead of white blood cells recognizing the presence of normal thyroid cells, these antibodies attack them, causing low thyroid. If untreated, this condition can result in retardation, extreme fatigue, obesity, and ultimately death. Through cytology, the abnormal reactions of these antibodies can be recognized, and treatment can be undertaken long before this condition creates irreversible problems.

Cytopathology has similar aims, but tends to look for cells that should not be present in an organism. Urinalysis and blood tests, for example, can scan for the presence of parasites or bacteria which can cause illness and death. Hence, in cytology, understanding single-celled organisms like many forms of bacteria is as important as understanding multi-cellular structures.

This is also one of the main diagnostic tools for detecting cancer. A woman's yearly gynecological exam almost always involves a pap smear, a collection of tissues that are analyzed at the cellular structure to detect early formations of cancer cells. Early detection can lead to greater survival rates. Similarly, needle biopsies of lumps in the breast or elsewhere can detect cancer cells and provide an excellent means for diagnosis.

BOTANY

Botany, also called **plant science**(**s**) or **plant biology**, is the science of plant life and a branch of biology. A **botanist** or **plant scientist** is a scientist who specializes in this field of study. The term "botany" comes from the Ancient Greek word βοτάνη (*botanē*) meaning "pasture", "grass", or "fodder"; βοτάνη is in turn derived from βόσκειν (*boskein*), "to feed" or "to graze".Traditionally, botany has also included the study of fungi and algae by mycologists and phycologists respectively, with

the study of these three groups of organisms remaining within the sphere of interest of the International Botanical Congress. Nowadays, botanists study approximately 400,000 species of living organisms of which some 260,000 species are vascular plants and about 248,000 are flowering plants.

Botany originated in prehistory as herbalism with the efforts of early humans to identify – and later cultivate – edible, medicinal and poisonous plants, making it one of the oldest branches of science. Medieval physic gardens, often attached to monasteries, contained plants of medical importance. They were forerunners of the first botanical gardens attached to universities, founded from the 1540s onwards. One of the earliest was the Padua botanical garden. These gardens facilitated the academic study of plants. Efforts to catalogue and describe their collections were the beginnings of plant taxonomy, and led in 1753 to the binomial system of Carl Linnaeus that remains in use to this day.

In the 19th and 20th centuries, new techniques were developed for the study of plants, including methods of optical microscopy and live cell imaging, electron microscopy, analysis of chromosome number, plant chemistry and the structure and function of enzymes and other proteins. In the last two decades of the 20th century, botanists exploited the techniques of molecular genetic analysis, including genomics and proteomics and DNA sequences to classify plants more accurately.

Modern botany is a broad, multidisciplinary subject with inputs from most other areas of science and technology. Research topics include the study of plant structure, growth and differentiation, reproduction, biochemistry and primary metabolism, chemical products, development, diseases, evolutionary relationships, systematics, and plant taxonomy. Dominant themes in 21st century plant science are molecular genetics and epigenetics, which are the mechanisms and control of gene expression during differentiation of plant cells and tissues. Botanical research has diverse applications in providing staple foods and textiles, in modern horticulture, agriculture and forestry, plant propagation, breeding and genetic modification, in the synthesis of chemicals and raw materials for construction and energy production, in environmental management, and the maintenance of biodiversity.

HISTOLOGY

Histology (compound of the Greek words: ἱστός *histos* "tissue", and -λογία *-logia* "science") is the study of the microscopic anatomy of cells and tissues of plants and animals. It is commonly performed by examining cells and tissues under a light microscope or electron microscope, which have been sectioned, stained and mounted on a microscope slide. Histological studies may be conducted using tissue culture, where live human or animal cells are isolated and maintained in an artificial environment for various research projects. The ability to visualize or differentially identify microscopic structures is frequently enhanced through the use of histological stains. Histology is an essential tool of biology and medicine.

Histopathology, the microscopic study of diseased tissue, is an important tool in anatomical pathology, since accurate diagnosis of cancer and other diseases usually requires histopathological examination of samples. Trained physicians, frequently licensed pathologists, are the personnel who perform histopathological examination and provide diagnostic information based on their observations. The trained personnel who prepare histological specimens for examination are **histotechnicians, histology technicians (HT), histology technologists (HTL), medical scientists**, medical laboratory technicians, or biomedical scientists. Their field of study is called **histotechnology**.

D.I. MENDELEEV

Dmitri Mendeleev was born at Tobolsk, Siberia in 1834 and died in 1907. Mendeleev studied science at St. Petersburg and graduated in 1856. In 1863 Mendeleev was appointed to a professorship and in 1866 he succeeded to the Chair in the University. Mendeleev is best known for his work on the periodic table; arranging the 63 known elements into a Periodic Table based on atomic mass, which he published in ***Principles of Chemistry*** in 1869. His first Periodic Table was compiled on the basis of arranging the elements in ascending order of atomic weight and grouping them by similarity of properties. He predicted the existence and properties of new elements and pointed out accepted atomic weights that were in error. This organization surpassed attempts at classification by Beguyer de Chancourtois and Newlands and was published a year before the work of Lothar Meyer.

Mendeleev provided for variance from strict atomic weight order, left space for new elements, and predicted three yet-to-be-discovered elements including eke-silicon and eke-boron. His table did not include any of the Noble Gases, however, which had not yet been discovered. The original table has been modified and corrected several times, notably by **Moseley**, but it had accommodated the discovery of isotopes, rare gases, etc.

Mendeleev anticipated Andrews' concept (1869) of the critical temperature of gases. He also investigated the thermal expansion of liquids, and studied the nature and origin of petroleum. He was considered one of the greatest teachers of his time. In 1890 he resigned his professorship and in 1893 became director of the bureau of weights and measures in St. Petersburg, where he remained until his death in 1907.

CHEMIST'S

Chemist's shop (also called a pharmacy in Great Britain or a drug store in the USA) is an institution of health service. It supplies the population with medicines and medical things. It is a place where a wide variety of articles is sold and prescription can be made; drugs are composed, dispensed, stored and sold. They are differentiated into municipal, public and private ones. An ordinary chemist's shop has a chemist's department, a prescription one, proper working rooms and a hall for visitors. All medicines are kept in drug cabinets, open shelves and refrigerators there.

At the chemist's department one buys drugs ready to use, different things for medical care and medical herbs.

Poisonous, drastic, narcotic and psychotropic drugs are sold by prescription only at the prescription department. These drugs are potent and can be dangerous if taken in an overdose. Therefore, their use is strictly controlled.

In Great Britain all the drugs are legally divided into three groups: General Sales List (GSL, i.e. drugs for general sale); pharmacy medicines (i.e. drugs which are sold without prescription, but under the pharmacist's control); prescription only medicines (POM, i.e. drugs sold by prescription only).

All containers of dispensed medicines should be clearly labelled with the following particulars: name of the patient, name of the medicine, correct dosage instructions, date of dispensing, expiry date, warnings or contradictions, name and address of the pharmacy.

The pharmacist instructs the patient about: the necessity to follow the prescribed directions carefully; the dangers of overdosage; the problems resulting from an inadequate dosage; the expected side effects of the drug; the proper storage of the drug, etc.

The structure of a complete prescription includes six essential parts: the patient's name, the superscription, the inscription (the body of the prescription), the subscription, the signature and the prescriber's name.

In continental Europe, prescriptions are written out entirely in Latin abbreviations. The only exception is the signature which contains directions to the patients. That's why European medical schools require up to two years of Latin as part of the curriculum for medical doctors and pharmacists.

In Great Britain all prescriptions are written out in the English language only. They don't use any Latin abbreviations to avoid ambiguity and misunderstanding which might lead to serious consequences. If they do use any Latin abbreviations they are quite wide-spread and easy to read.

HEALTH AND ENVIRONMENT

Ecology is the science of how living things are related to their environment. People from all over the world are concerned about their ecology today. They are concerned about protecting the environment from pollution, overcrowding, and destruction of natural resources.

These are the names of the environmental problems of today:

Littering Facts. Litter is a form of environmental pollution that is very easy to see around us. We sometimes see it on the roadside, in the school playground or in the park. For example, in 1993, each person in the United States threw away about four pounds (1.8 kg) of trash daily. It is possible that land pollution might also contaminate the air and the water.

Air pollution Smog Facts. Worldwide, the problem of air pollution has grown. More and more factories, cars, and trucks add their exit gases to the air. Every year world industry pollutes the atmosphere with million tons of dust and other detrimental substances. People of many cities suffer from smog.

The impact of air pollution is also global warming. Carbon dioxide is one of life's most essential molecules. Atmospheric carbon dioxide also has a warming effect on the planet. Global warming could potentially have a profound impact on species, both plant and animal. Although some organisms may adapt to rising temperatures or migrate to areas more suitable for survival, it is unlikely that the majority of the world's species will adjust quickly enough to survive.

Water pollution Facts: Water pollution is any contamination of water with chemicals or other foreign substances that are detrimental to human, plant, or animal health. Nearly half of the lakes in North America are polluted. Often, companies dump chemical wastes into water. But scientists are finding a solution to this problem by means of applying wasteless and resource-saving technologies. Some rivers have been made much cleaner. And there are big plans to clean up the Great Lakes, the Chesapeake Bay, the Mississippi River, and other bodies of water.

Overcrowding Overpopulation Facts: The population growth rate poses significant environmental problems. Some ecologists and population scientists have suggested that in order for humankind to live within the earth's carrying capacity in the future, it will be necessary not simply to slow population increases but to actually reduce the size of the human population through attrition, that is, by reducing the birth rate to a level below the death rate.

Destruction of natural resources Facts: Wind and rain are responsible for natural soil erosion, a process in which fine particles are carried off from soil. This process is also greatly accelerated by activities such as farming, construction, and mining. Soil erosion on farms and pastures is of greatest concern because it reduces the long-term productive capacity of the land, thus lowering the earth's carrying capacity. It also destroys habitats on which other species depend.

Many nations of the world are currently facing water shortages, a result of the inefficient use of water, overpopulation, or combinations of these factors. Nowadays numerous water-saving technologies are also available to industry and for agriculture. These include water-recycling systems for large companies, and farm irrigation systems.

Deforestation may have serious global implications. Consequences include the loss of plant and animal species as a result of the elimination of major habitats; deforestation has a particularly immediate effect in developing nations, where wood remains an essential fuel source for cooking and heating. Strategies for protecting the world's forests and ensuring a steady stream of ecological goods and services include massive recycling of paper and cardboard and increased efficiency in the use of wood in construction. Widespread reforestation projects are also called for to help offset previous losses and increase the world's forest cover.

CHEMICALS, HUMAN HEALTH AND THE ENVIRONMENT

In the last few decades, there have been enormous developments in the use of chemicals in a wide range of human activities. While there can be no doubt that chemicals have brought great benefits to society, it is now apparent that there is a price to pay, in terms of human health and the quality of the environment, which could escalate unless vigorous action is taken to control their use.

Provided adequate controls had been taken in the past, relatively simple chemicals could not have interfered with vital living processes in unexpected ways. It is not only the vast quantity of chemicals produced that is remarkable; but their great variety, and the fact that there are few aspects of daily life in which synthetic chemicals do not play some role.

Unless a series of tragic incidents had occurred, much consideration for possible health effects would not have been taken. In 1959, an unusua1 disease was reported in Japan. This was found to be associated with the industrial discharge of mercury compounds into neighboring waterways. If the mercury were not accumulated by the local fish, it wouldn't reach toxic concentrations; over a thousand people wouldn't become ill.

This accident highlighted the fact that toxic effects can follow from relatively low exposures repeated over a long period. However short were the period of exposиre, it did induce significant adverse effects.

The production of polyethylene was believed to be safe. It was found to cause a rare cancer of the liver in workers exposed to its high concentrations. On condition that the results of animal studies confirmed this finding, the question of the safety of many other chemicals used in the plastic industry would be raised.

It became clear that, unless collaborative efforts were made, toxic effects, not only on present but on future generations could result from exposures to chemicals in air, food and at the place of work.

DIGESTIVE SYSTEM

The digestive system consists of the alimentary canal and related or accessory organs.

The alimentary canal is formed by the mouth, pharynx, esophagus, stomach, small intestine, large intestine and rectum.

The accessory structures are the teeth, tongue, salivary glands, hard and soft palates, liver, gallbladder and pancreas.

The alimentary tract from esophagus to rectum conforms to a definite structural plan. The layers from within outward are mucous, submucous, muscular and serous. In the esophagus the serous layer is lacking and the outer coat is fibrous in nature.

The organs of the digestive system contained in the abdomen are covered with the serous coat — the peritoneum. The peritoneum has two layers, the visceral and parietal.

The mouth is the first division of the alimentary tract. Important structures of the mouth are the tongue, which contains the end organ for taste, and the teeth which divide and mix the food. There are two sets of teeth, first the deciduous or milk teeth and later the permanent teeth.

The palatine tonsils are on the lateral walls of the oral pharynx between the palatine arches.

The oral and laryngeal portions of the pharynx serve as a channel for the passage of both food and air; food is conducted through it from the mouth to the esophagus and air from the nasal pharynx to the larynx.

The esophagus conveys food from the pharynx to the stomach.

The stomach is a dilated portion of the alimentary canal lying in the upper abdomen just under the diaphragm. It is a retaining and mixing reservoir in which the process of digestion begins.

The circular muscle layer is thickened at the pyloric and cardiac orifices to form sphincters. The glands of the fundus and body are most important in the secretion of gastric juice. They are formed mainly of chief and parietal cells.

The small intestine is a thin-walled muscular tube about 7 meters long. Its three portions are: duodenum, jejunum and ileum.

The bile and pancreatic ducts empty into the duodenum.

Special structural features of the small intestine are the villi and the circular folds. The intestinal glands or crypts of Lieberkiihn secrete the intestinal juice containing the digestive enzymes.

The large intestine is about 1.5 meters long and is divided into caecum, colon and rectum.

The large salivary glands consist of the parotid, the submaxillary and the sublingual. Ducts from the three pairs of glands open into the mouth.

The liver is the largest gland in the body. It is directly beneath the diaphragm on the right side of the abdomen. The liver cells are arranged in architectural units, called lobules.

The bile capillaries and sinusoids lie between chains of liver cells in the lobule. Branches of the portal vein, bile duct and hepatic arteries encircle the periphery of the lobule.

The liver secretes bile and has many other important functions such as stimulation of red bone marrow, production of fibrinogen, glycogemetic function and urea synthesis.

The gallbladder is a pear-shaped hollow sac attached to the under surface of the liver. It concentrates the bile.

The pancreas is a long slender organ with its head to the right in the loop of the duodenum, its body posterior to the stomach and its tail touching- the spleen on the left.

The pancreas forms an external secretion important in digestion and an internal secretion, insulin, concerned with carbohydrate metabolism.

RESPIRATION

Respiration is the process in which air passes into and out of the lung with the object of allowing the blood to absorb oxygen and to give off carbon dioxide and water.

Mechanism of respiration. The air passes rhythmically into and out of the air passages, and mixes with the air already in the lungs, these two movements being known as inspiration and expiration.

Inspiration is due to a muscular effort which enlarges the chest in all three dimensions, so that the lungs have to expand in order to fill up the vacuum that would otherwise be left, and the air accordingly enters these organs by the air passages. It must be understood that there is no direct pull upon the lungs, each of which is simply suspended within the corresponding pleural cavity by its root, and made to fill this cavity in all conditions of the chest by the pressure of the outer air exerted through the nose, mouth, and air passages.

The increase of the chest in size from above downwards is mainly due to the diaphragm, whose muscular fibres by their contraction reduce its domed shape and cause it to descend, pushing down the abdominal organs beneath it. The increase from before back is mainly due to a tilting forwards of the lower end of the breastbone, and of the lower rib cartilages. The increase from side to side can best be understood by examining a skeleton, noting the very oblique position of the lower ribs, and observing how greatly the capacity of the chest is increased when each is raised taking its fixed points at the spine and breastbone.

The muscles which chiefly bring about these changes in ordinary, quiet inspiration are the diaphragm, intercostal muscles and levators of the ribs, while in forced or extraordinary inspiration, when a specially deep breath is taken, the sternomastoid, serratus magnus, trapezius, and pectoral muscles are also brought powerfully into play. One must note that many other muscles take part to a slight extent, steadying the spine and the upper and lower ribs, while even the muscles of the face and of the larynx are thrown rhythmically into activity, dilating the nostrils and the entrance to the larynx at each breath.

Expiration is in ordinary circumstances simply an elastic recoil, the diaphragm rising and the ribs sinking into the position that they naturally occupy, when muscular contraction is finished. Expiration occupies a slightly longer period than inspiration. In forced expiration many powerful muscles of the abdomen and thorax are brought into play, and the act may be made a very forcible one, as, for example, in coughing.

Nervous control. Respiration is usually either an automatic or a reflex act, each expiration sending up afferent, sensory impulses to the central nervous system, from which efferent impulses are sent down various other nerves to the muscles that produce inspiration.

From the recent researches it appears that there are several centres which govern the rate, force, etc., of the breathing, though all are presided over by a chief respiratory centre in the medulla oblongata, which is sometimes spoken of as the vital knot. Though this centre appears to be absolutely essential to life, it in turn is under the control of the higher centres in the cerebral hemispheres, through which the will acts, so that breathing can be voluntarily stopped, quickened, or otherwise changed at will.

It would be impossible, however, to cause death voluntarily holding the breath, because, as the blood becomes more venous, the vital centre in the medulla again assumes control and breathing recommences. Apart from changes due to willpower, the respirations follow one another rhythmically at the rate of about 18 per minute, being in general one for every four heartbeats.

Quantity of air. The lungs do not by any means completely empty themselves at each expiration and refill at each inspiration. An amount equivalent, in quiet respiration, to less than one-tenth of the total air in the lungs passes out and is replaced by the same quantity of fresh air, which mixes with the stale air in the lungs. This renewal, which in quiet breathing amounts to about 30 cubic inches or I pint of air or about 500 cc is known as the tidal air.

By a special inspiratory effort, one can, however, draw in about 180 cubic inches, i. e., over 6 pints of air or 3000 cc, this amount being known as complemental air. By a special expiratory effort too, after an ordinary breath one can expel much more than the tidal air from the lungs, this extra amount being known as the supplemental or reserve air, and amounting also to about 60 cubic inches or 1000 cc.

If one takes as deep an inspiration as possible and then makes a forced expiration, one breathes out the sum of these three, which is known as the vital capacity, and amounts to about 4000 cc in a healthy adult male of average size.

Over and above the vital capacity, the lungs contain air which cannot be emptied by the strongest possible expiration, and this residual air, which remains in the lungs even after death, amounts to at least another 1000—1500 cc.

HEART

Heart is a hollow muscular organ with four cavities, each provided at its outlet with a valve, whose function is to maintain the circulation of the blood. The two upper cavities are known as atria or auricles, the two lower ones as ventricles.

The heart lies in the chest between the two lungs, but projecting more to the left side than to the right. On the left side its apex reaches out almost to the nipple, and lies beneath the fifth rib, while its right border extends only a short distance, at most an inch, beyond the margin of the breastbone. Its lower border rests upon the diaphragm by which it is separated from the liver and stomach. Above, the heart extends to the level of the second rib, where the great vessels, the aorta on the right side and the pulmonary artery on the left, lie behind the breastbone.

The heart of an individual was described as, roughly, of the size and shape of the clenched fist. One end of the heart is pointed (apex), the other is broad (base).

Structure. The heart lies within a strong fibrous bag, known as the pericardium, and since the inner surface of this bag and the outer surface of the heart are both covered with a smooth, glistening membrane faced with flat cells and lubricated by a little serous fluid, the movements of the heart are accomplished almost without friction. The main thickness of the heart wall consists of bundles of muscle fibres.

Within all the cavities is a smooth lining membrane continuous with that lining the vessels which open into the heart. The investing smooth membrane is known as epicardium, the muscular substance as myocardium, and the smooth lining membrane as endocardium.

For the regulation of the heart's action there are important nervous connections, especially with the vagus and with the sympathetic nerves.

There is no direct communication between the cavities on the right side and those on the left; but the right auricle opens into the right ventricle by a large circular opening, and similarly the left auricle into the left ventricle. Into the right auricle open two large veins, the superior and inferior venae cavae, with some smaller veins from the wall of the heart itself, and into the left auricle open two pulmonary veins from each lung. One opening leads out of each ventricle, to the aorta in the case of the left ventricle, to the pulmonary artery from the right. As stated above there are four valves. Two of these are placed at the openings leading from auricle into ventricle, the "tricuspid valve" on the right side, the "mitral valve" on the left, so as completely to prevent blood from running back into the auricle when the ventricle contracts. Two more, the "pulmonary valve" and the "aortic valve, are placed at the entrance to these arteries, and prevent regurgitation into the ventricles of blood which has been driven from them into the arteries. The noises made by these valves in closing are known as the heart sounds, and can be heard by anyone who applies his ear to the front of a person's chest.

Приложение 2

Министерство здравоохранения Российской Федерации
Федеральное государственное бюджетное образовательное учреждение высшего образования
«Саратовский государственный медицинский университет им. В.И. Разумовского»
Министерства здравоохранения Российской Федерации
(ФГБОУ ВО Саратовский ГМУ им. В.И.Разумовского Минздрава России)

КАФЕДРА ИНОСТРАННЫХ ЯЗЫКОВ

УТВЕРЖДАЮ
Заведующий кафедрой иностранных языков

_____Чернышкова Е.В.

«_____» _____ 20 ____ г.

МЕТОДИЧЕСКИЕ УКАЗАНИЯ

ДЛЯ ОБУЧАЮЩИХСЯ ПО ОСВОЕНИЮ ДИСЦИПЛИНЫ

Дисциплина Иностранный язык (английский)

Специальность Фармация 33.05.01

Форма обучения очная

Курс 1 **Семестр** 1-2

Составители: доцент, к.псх.н. Ю.Я. Веретельникова

Одобрены на заседании учебно-методической конференции кафедры
протокол от «_____ » _____ 20___ г. № _____ .

МЕТОДИЧЕСКИЕ УКАЗАНИЯ К ПРАКТИЧЕСКИМ ЗАНЯТИЯМ

1 семестр

Практическое занятие № 1

Тема: О себе и своей будущей профессии

Перечень рассматриваемых вопросов:

1. Правила чтения, произношения и интонирования.
2. Правила словообразования и основы морфологии.
3. Лексика по теме.
4. Порядок слов в повествовательном предложении; спряжение глаголов to be, to have в Present, Past, Future Indefinite; времена группы Indefinite Active.

Вопросы для самоподготовки к освоению данной темы.

1. Where do you study?
2. What faculty do you study at?
3. When does your working day begin?
4. What subjects do you study?
5. What do you do after classes?

Задание для самоподготовки к следующему занятию по теме

Подготовить монологическое высказывание «О себе и своей будущей профессии».

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 2-3

Тема: Медицинское образование в России

Перечень рассматриваемых вопросов:

1. Правила словообразования и морфологии.
2. Лексика по теме (продуктивно).
3. Число существительных; артикли; местоимения (личные, притяжательные), числительные; система времен глагола (личные формы глагола).

Вопросы для самоподготовки к освоению данной темы.

1. Where can a person get higher medical education in Russia?
2. How can a person enter a higher medical school?
3. How long does the medical education last in Russia?
4. What periods is the course of studies in Russia divided into?
5. What subjects do the students study?

Задание для самоподготовки к следующему занятию по теме

Подготовить монологическое высказывание «Медицинское образование в России».

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 4-5

Тема: Саратовский государственный медицинский университет

Перечень рассматриваемых вопросов:

1. Лексика по теме (продуктивно).
2. Способы передачи падежных отношений; предлоги; оборот there + be; безличные предложения, степени сравнения имен прилагательных, указательные и неопределенные местоимения.

Вопросы для самоподготовки к освоению данной темы.

1. When was SSMU founded?
2. Who was the founder and the first rector of the University?
3. When did the medical faculty of the University become an independent medical Institute?
4. What faculties were opened at Saratov Medical Institute in 1930?
5. What faculties are there at SSMU now?

Задание для самоподготовки к следующему занятию по теме

Подготовить монологическое высказывание «Саратовский государственный медицинский университет».

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 6 -7

Тема: Рабочий день студента-медика

Перечень рассматриваемых вопросов:

1. Лексика по теме (продуктивно).
2. Модальные глаголы can, may, must, указательные и неопределенные местоимения, степени сравнения прилагательных и наречий.

Вопросы для самоподготовки к освоению данной темы.

1. Where do you study?
2. What faculty do you study at?
3. When does your working day begin?
4. What subjects do you study?
5. What do you do after classes?

Задание для самоподготовки к следующему занятию по теме

Подготовить монологическое высказывание «Рабочий день студента-медика».

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 8-9

Тема: Медицинское фармацевтическое образование в странах изучаемого языка

Перечень рассматриваемых вопросов:

1. Лексика по теме (продуктивно).
2. Общий и специальный вопросы; образование Present Participle;
   времена группы Continuous Active, модальные глаголы can, may, must.

Вопросы для самоподготовки к освоению данной темы.

1. Where can a person get higher medical education in Great Britain/ in the USA?
2. How can a person enter a higher medical school?
3. How long does the medical education last in Great Britain/ in the USA?
4. What periods is the course of studies in Great Britain/ in the USA divided into?
5. What subjects do the students study?

Задание для самоподготовки к следующему занятию по теме

Подготовить монологическое высказывание «Медицинское фармацевтическое образование в странах изучаемого языка».

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 10-12

Тема: Материя

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии.
2. Лексика по теме (продуктивно).
3. Времена группы Indefinite Passive; образование Past Participle; согласование времен; парные союзы; согласование времен.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

1. What is matter?
2. What are the states of matter?
3. What do physics and chemistry study?
4. What are physical and chemical properties of matter?
5. What are analysis and synthesis?

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 13 -15

Тема: Химия

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии
2. Лексика по теме (продуктивно).
3. Синтаксис.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

1. What does chemistry study?
2. What are the main types of substances?
3. What properties do substances have?
4. What are physical properties of substances?
5. What are chemical properties of substances?

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 16-18

Тема: Клетка

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии
2. Лексика по теме (продуктивно).
3. Времена группы Perfect Active; неопределенно-личные предложения.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

1. What is cytology?
2. What is a cell?
3. What are the main organelles of the cell?
4. What is phagocytosis?
5. What is pinocytosis?

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 19-21

Тема: Клеточное деление (Генетика)

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии.
2. Лексика по теме (продуктивно).
3. Система времен глагола (личные и неличные формы глагола); страдательный залог.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

1. What is genetics?
2. What is the basic unit of heredity?
3. What controls hereditary traits?
4. What is mitosis?
5. What is meiosis?

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 22-24

Тема: Гистология. Ткани.

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии.
2. Лексика по теме (продуктивно).
3. Система времен глагола (личные и неличные формы глагола); страдательный залог.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

1. What does histology deal with?
2. What is a tissue?
3. What are the main groups of tissues?
4. What is the difference between various types of tissues?
5. What are the functions of various groups of tissues?

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 25-29

Тема: Ботаника

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии.
2. Лексика по теме (продуктивно).
3. Система времен глагола (личные и неличные формы глагола); страдательный залог.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

1. What does botany deal with?
2. What is a plant? Flower?
3. What are the main groups of plants?
4. What are the different types of plat/flower parts?

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

2 семестр

Практическое занятие № 1-3

Тема: История медицины.

Перечень рассматриваемых вопросов:

1. Лексика по теме (продуктивно).
2. Грамматические конструкции, характерные для устной формы профессионального общения.

Вопросы для самоподготовки к освоению данной темы.

1. What are the three main stages in the history of medicine?
2. What are the main achievements in ancient medicine?
3. What are the main achievements in medicine of Middle Ages?
4. What are the main achievements in modern medicine?
5. What are the names of the most famous scientists in the history of medicine?

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 4-5

Тема: Выдающиеся медики: Д.И.Менделеев

Перечень рассматриваемых вопросов:

1. Лексика по теме (продуктивно).
2. Грамматические конструкции, характерные для устной формы профессионального общения.

Вопросы для самоподготовки к освоению данной темы.

1. When was he born?
2. Where and how did he study?
3. When did he begin to work?
4. What is he famous for?
5. When did he die?

Задание для самоподготовки к следующему занятию по теме

Подготовить монологическое высказывание «Выдающиеся медики: Д.И.Менделеев».

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 6-7

Тема: Аптека

Перечень рассматриваемых вопросов:

1. Лексика по теме (продуктивно).
2. Грамматические конструкции, характерные для устной формы профессионального общения.

Вопросы для самоподготовки к освоению данной темы.

1. What is chemist's or drug store?
2. What are the departments of a chemist's?
3. What kinds of medicines can one get at the chemist's department?
4. What kinds of medicines are sold by prescription?
5. What are the duties of a pharmacist?

Задание для самоподготовки к следующему занятию по теме

Подготовить монологическое высказывание «Аптека».

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 8-9

Тема: Рецептура

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии.

2. Лексика по теме (продуктивно).
3. Система времен глагола (личные и неличные формы глагола); страдательный залог.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

Рецептура, виды рецептов, правила оформления.

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 10-11

Тема: Лекарственные формы

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии.
2. Лексика по теме (продуктивно).
3. Система времен глагола (личные и неличные формы глагола); страдательный залог.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

Лекарственные формы, виды, продажа, прием препаратов.

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 12-13

Тема : Способы применения лекарств

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии.
2. Лексика по теме (продуктивно).
3. Система времен глагола (личные и неличные формы глагола); страдательный залог.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

Способы применения лекарств, побочные эффекты.

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 14-15

Тема: Промышленное производство лекарственных средств

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии.
2. Лексика по теме (продуктивно).
3. Система времен глагола (личные и неличные формы глагола); страдательный залог.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

Промышленное производство лекарственных средств: способы, особенности.

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 16-17

Тема: Всемирная организация здравоохранения. Сотрудничество в области медицины.

Перечень рассматриваемых вопросов:

1. Лексика по теме (продуктивно).
2. Грамматические конструкции, характерные для устной формы профессионального общения.

Вопросы для самоподготовки к освоению данной темы.

1. When was WHO founded?
2. How many member states are there in WHO?
3. What are the forms of activities of WHO?
4. What are the three types of international cooperation in medicine?
5. What are the forms of Russian-British and Russian-American cooperation?

Задание для самоподготовки к следующему занятию по теме

Подготовить монологическое сообщение по теме «ВОЗ. Сотрудничество в области медицины»

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 18-19

Тема: Химия и здоровье

Перечень рассматриваемых вопросов:

1. Лексика по теме (продуктивно).
2. Грамматические конструкции, характерные для устной формы профессионального общения.

Вопросы для самоподготовки к освоению данной темы.

Взаимосвязь между химией и здоровьем

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 20-21

Тема: Здоровье и окружающая среда

Перечень рассматриваемых вопросов:

1. Лексика по теме (продуктивно).
2. Грамматические конструкции, характерные для устной формы профессионального общения.

Вопросы для самоподготовки к освоению данной темы.

1. What is ecology?
2. What sub-disciplines contribute to the science of ecology?
3. What major human activities affect the ecologic balance?
4. What is an ecosystem?
5. What does ecological crisis mean?

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 22-23

Тема: Микробиология

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии

2. Лексика по теме (продуктивно).
3. Синтаксис.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

1. What is microbiology?
2. What are the most common microorganisms?
3. What are the portals of entry of infection?
4. What is bacteraemia?
5. What is viraemia?

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 24

Тема: Организм человека. Части тела, полости, органы и системы органов

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии
2. Лексика по теме (продуктивно).
3. Синтаксис.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

3. What is a human organism?
4. What are the main parts of the human body?
3. What are the systems of the body?
4. What cavities are there in the human body?
5. What paired organs are there in the human body?

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 25

Тема: Скелетная система. Скелет. Череп.

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы

морфологии

2. Лексика по теме (продуктивно).
3. Синтаксис.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

1. What is the skeleton? What is the skeleton composed of?
2. How many bones are there in the skeleton of the adult?
3. What are the bones of the trunk?
4. What does the upper (lower) extremity consist of?
5. What are the functions of the musculo-skeletal system?

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 26

Тема: Дыхательная система.

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии
2. Лексика по теме (продуктивно).
3. Синтаксис.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

1. What organs is the respiratory system composed of?
2. Where are the respiratory organs located?
3. What is the structure of the lungs?
4. How is the process of respiration carried out?
5. What are the functions of the respiratory system?

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 27

Тема: Система кровообращения.

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы

морфологии

2. Лексика по теме (продуктивно).
3. Синтаксис.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

1. What is the cardio-vascular system composed of?
2. What are the main branches of the circulatory system?
3. Where is the heart located?
4. What does the heart consist of?
5. What are the main functions of the cardio-vascular system?

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

Практическое занятие № 28-29

Тема: Пищеварительная система.

Перечень рассматриваемых вопросов:

1. Правила словообразования (употребление аффиксов для образования частей речи); основы морфологии
2. Лексика по теме (продуктивно).
3. Синтаксис.
4. Обучение ознакомительному, просмотровому, изучающему и поисковому видам чтения.
5. Обучение умению пользоваться словарями (общеязыковыми, специальными) с целью выбора слова с учетом контекста.

Вопросы для самоподготовки к освоению данной темы.

1. What organs is the gastro-intestinal tract formed by?
2. Where is the stomach located?
3. What parts is the intestine divided into?
4. What are the subdivisions of the small (large) intestine?
5. What are the main functions of the digestive system?

Задание для самоподготовки к следующему занятию по теме

Рекомендуемая литература.

1. Английский язык [Текст] : учебник / И. Ю. Марковина, З. К. Максимова, М. Б. Вайнштейн ; под общ. ред. И. Ю. Марковиной. - 4-е изд., перераб. и доп. - М. : ГЭОТАР-Медиа, 2014. - 366 с.

2. МЕТОДИЧЕСКИЕ РЕКОМЕНДАЦИИ ПО ОРГАНИЗАЦИИ САМОСТОЯТЕЛЬНОЙ РАБОТЫ ПО ОСВОЕНИЮ ДИСЦИПЛИНЫ

Самостоятельная работа студентов является одним из видов планируемой учебной, учебно-исследовательской работы, целью которой является систематизация и закрепление теоретических знаний и практических умений студентов, поиск и приобретение новых знаний, в том числе с использованием компьютерных технологий и электронных образовательных ресурсов, а так же выполнение учебных заданий, подготовку к предстоящим занятиям, зачетам и/или экзаменам.

Аудиторная самостоятельная работа по дисциплине выполняется на учебных занятиях под непосредственным руководством преподавателя и по его заданию. Она включает в себя работу с аутентичными текстами: ознакомительное, поисковое и др. виды чтения, перевод и реферирование. студенты выполняют тестовые задания по текущему контролю, лексико-грамматические и фонетические упражнения.

Внеаудиторная самостоятельная работа студентов включает в себя следующие аспекты:

- подготовку студента к практическим занятиям, к текущему контролю и/или тестированию, используя литературу, рекомендуемую преподавателем, и методические указания к занятиям;
- самостоятельное изучение отдельных тем и разделов учебной дисциплины (в соответствии с учебной программой); выполнение домашних заданий (перевод, реферирование оригинального текста);
- выполнение студенческой учебно-исследовательской и научно-исследовательской работы, подготовка научных статей и тезисов, докладов к конференциям;
- подготовка к зачету/экзамену.

Приложение 3

Сведения о материально-техническом обеспечении,
необходимом для осуществления образовательного процесса по дисциплине
« Иностранный язык»

№ п/п	Адрес (местоположение) здания, строения, сооружения, помещения	Собственность или оперативное управление, хозяйственное ведение, аренда, субаренда, безвозмездное пользование	Наименование кафедры	Назначение оснащенных зданий, сооружений, помещений (учебные, учебно-лабораторные, административные, подсобные, помещения для занятия физической культурой и спортом, для обеспечения обучающихся и сотрудников питанием и медицинским обслуживанием, иное), территорий с указанием площади (кв.м.)	Наименование оборудованных учебных кабинетов, объектов для проведения практических, объектов физической культуры и спорта	Наименование объекта	Инвентарный номер
1	ул. Горького, 1 кор.1, 3 этаж	Оперативное управление	Кафедра Иностранных языков	Учебные 30,3 кв.м	Учебная комната № 83	Доска классная ДА-32з Шкаф для документов 600-450-2200 Шкаф для документов со стеклом 800-400-2242 Стол преподавателя 900-500-750 Стол компьютерный 800-500-750 Парта 1000-770-750 (12 шт.)	000000000003839 201112000001183 000021010600056 201112000001192 201112000001129 201112000001240 201112000001228 201112000001230 201112000001231 201112000001232

						Стул (3 шт) Шторы жалюзи вертикальные (2 шт.)	201112000001227 201112000001226 201112000001225 201112000001224 201112000001223 201112000001233 201112000001234 б/н б/н
2	ул. Горького, 1 кор.1, 3 этаж	Оперативное управление	Кафедра Иностранных языков	Учебные, 21,4 кв.м	Учебная комната № 84	Доска классная ДА-32з Стол преподавателя 900-500-750 Шкаф для документов 6004502200 Парта 1000-770-750 (9 шт.) Парта (2 шт) Стул (2 шт) Шторы жалюзи вертикальные (2 шт.)	000000000003840 201112000001193 201112000001184 201112000001235 201112000001236 201112000001237 201112000001238 201112000001239 201112000001240 201112000001241 201112000001242 201112000001243 б/н б/н б/н
3	ул. Горького, 1 кор.1, 3 этаж	Оперативное управление	Кафедра Иностранных языков	Учебные, 25 кв.м	Учебная комната № 85	Доска классная ДА-32з Шкаф АМ 1845	000000000003841 210107000005029

						Стол преподавателя 900-500-750 Шкаф для документов 6004502200 Парта 1000-770-750 (11 шт.) Стул (3 шт.) Шторы жалюзи вертикальные (2 шт.)	201112000001193 201112000001187 201112000001244 201112000001207 201112000001206 201112000001205 201112000001204 201112000001203 201112000001202 201112000001201 201112000001208 201112000001209 201112000001210 б/н б/н

** (учебные, учебно-лабораторные, административные, подсобные, помещения для занятия физической культурой и спортом, для обеспечения обучающихся и сотрудников питанием и медицинским обслуживанием, иное)*

Приложение 4

Сведения о кадровом обеспечении,
необходимом для осуществления образовательного процесса по дисциплине
« Иностранный язык»

ФИО преподавателя	Условия привлечения (штатный, внутренний совместитель, внешний совместитель, по договору)	Занимаемая должность, ученая степень/ ученое звание	Перечень преподаваемых дисциплина согласно учебному плану	Образование (какое образовательное учреждение профессионального образования окончил, год)	Уровень образования, наименование специальности по диплому, наименование присвоенной квалификации	Объем учебной нагрузки по дисциплине (доля ставки)	Сведения о дополнительном профессиональ-ном образовании, год		Общий стаж работы	Стаж практической работы по профилю образовательной программы в профильных организациях с указанием периода работы и должности
							спец	пед		
Храмова Ю.А.	штатный	доцент	Иностранный язык	СГУ им. Н.Г. Чернышевского, 2004г.	Высшее, филолог, преподаватель, переводчик в сфере проф. коммун.	0,14	-	Методика преподавания в вузе. Кафедра философии, 2021г.	18 лет	-
Ефремова Е.Ф.	штатный	доцент, к.пед.н.	Иностранный язык	Пед институт при СГУ им. Н.Г. Чернышевского, 2004 г.	Высшее, учитель нем. и англ. языков	0,13	-	Методика преподавания в вузе. Кафедра педагогики 2021г.	18 лет	-

1. Общее количество научно-педагогических работников, реализующих основную профессиональную образовательную программу – 2 чел.
2. Общее количество ставок, занимаемых научно-педагогическими работниками, реализующими основную профессиональную образовательную программу - 0,27 ст

Пример расчета доли ставки*: 1 ставка = 900 учебных часов. У преподавателя по данной дисциплине 135 часов.*
Таким образом, 135 : 900 = 0,15 – доля ставки