МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ
РОССИЙСКОЙ ФЕДЕРАЦИИ
федеральное государственное бюджетное образовательное учреждение
высшего образования
МОСКОВСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ
ГЕОДЕЗИИ И КАРТОГРАФИИ
(МИИГАиК)

Геодезический факультет
Кафедра лингвистики

ДОКУМЕНТ ПОДПИСАН
ЭЛЕКТРОННОЙ ПОДПИСЬЮ

Сертификат: 5387FD2AF5B17FED816FDE9A1D4973B1
Владелец: Степанченко Алексей Леонидович
Действителен: с 21.07.2025 по 14.10.2026

«УТВЕРЖДАЮ»
Проректор
А. Л. Степанченко
17 февраля 2023 г.

ФОНД ОЦЕНОЧНЫХ СРЕДСТВ ПО ДИСЦИПЛИНЕ (МОДУЛЮ) МОДУЛЬ. ОБЩЕОБРАЗОВАТЕЛЬНЫЕ ДИСЦИПЛИНЫ «Б1.О.01.05 ИНОСТРАННЫЙ ЯЗЫК»

Уровень высшего образования: бакалавриат

Направление подготовки: 21.03.03 Геодезия и дистанционное зондирование

Направленность(профиль) подготовки: Геодезия

Квалификация (степень) выпускника: бакалавр

Форма обучения: очная

Год набора (приема на обучение): 2023

Срок получения образования: 4 года

Объем: в зачетных единицах: 7 з.е.
в академических часах: 252 ак.ч.

Москва, 2023

Разработчики:
Заведующий кафедрой Лингвистики, доцент Герасимов И. П.

Старший преподаватель кафедры Лингвистики Ацута Е. В.

Старший преподаватель кафедры Лингвистики Трофименко С. А.

Фонд оценочных средств по дисциплине (модулю) составлен в соответствии с требованиями ФГОС ВО по направлению подготовки 21.03.03 Геодезия и дистанционное зондирование, утвержденного приказом Минобрнауки от 12.08.2020 № 972

Согласование и утверждение

№	Подразделение	Ответственное лицо	ФИО	Виза	Дата, протокол (при наличии)
1	Геодезический факультет	Председатель ученого совета факультета	Половнев О. В.	Рассмотрено	23.01.2023, № 8

1. Планируемые результаты обучения, соотнесенные с планируемыми результатами освоения образовательной программы

УК-4 Способен осуществлять деловую коммуникацию в устной и письменной формах на государственном языке Российской Федерации и иностранном(ых) языке(ах)

УК-4.1 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

Знать:

УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников

Уметь:

УК-4.1/Ум1 Выполнять переводы технических текстов с иностранного языка

Владеть:

УК-4.1/Нв1 Навыками чтения, аудирования, разговорной речи, письмо в профессиональной области

УК-4.2 Выполняет перевод профессиональных текстов с иностранного языка на государственный язык РФ и с государственного языка РФ на иностранный

Знать:

УК-4.2/Зн1 Основные способы работы на языковым и речевым материалом

Уметь:

УК-4.2/Ум1 Выполнять перевод технических текстов с иностранного языка

Владеть:

УК-4.2/Нв1 Приемами самостоятельной работы с языковым материалом с использованием справочной и учебной литературы

УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках

Знать:

УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребительного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи

Уметь:

УК-4.3/Ум1 Осуществляет коммуникацию с зарубежными партнерами; переводит научно-техническую литературу, связанную с профессиональной деятельностью

Владеть:

УК-4.3/Нв1 Стратегиями проведения сопоставительного анализа факторов культуры различных стран

УК-4.4 Представляет свою точку зрения при деловом общении и в публичных выступлениях

Знать:

УК-4.4/Зн1 Лексический минимум в объеме 2000 лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников

Уметь:

УК-4.4/Ум1 Осуществлять коммуникацию с зарубежными партнерами; переводить научно-техническую литературу по вопросами, связанным с профессиональной деятельностью

Владеть:

УК-4.4/Нв1 Компенсаторными умениями, помогающими преодолеть "сбои" в коммуникации, вызванные объективными и субъективными, социокультурными причинами

2. Показатели и критерии оценивания компетенций

Планируемые результаты освоения программы	Уровень овладения	Критерии оценивания (перечень сформированных ИДК/ЗУВ по уровням освоения)
УК-4 Способен осуществлять деловую коммуникацию в устной и письменной формах на государственном языке Российской Федерации и иностранном(ых) языке(ах)	Повышенный	ИДК УК-4.1 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 Знать: УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников Уметь: УК-4.1/Ум1 Выполнять переводы технических текстов с иностранного языка Владеть: УК-4.1/Нв1 Навыками чтения, аудирования, разговорной речи, письмо в профессиональной области ИДК УК-4.2 Выполняет перевод профессиональных текстов с иностранного языка на государственный язык РФ и с государственного языка РФ на иностранный Знать: УК-4.2/Зн1 Основные способы работы на языковым и речевым материалом Уметь: УК-4.2/Ум1 Выполнять перевод технических текстов с иностранного языка Владеть: УК-4.2/Нв1 Приемами самостоятельной работы с языковым материалом с использованием справочной и учебной литературы

			ИДК УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках Знать: УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребительного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи Уметь: УК-4.3/Ум1 Осуществляет коммуникацию с зарубежными партнерами; переводит научно-техническую литературу, связанную с профессиональной деятельностью Владеть: УК-4.3/Нв1 Стратегиями проведения сопоставительного анализа факторов культуры различных стран ИДК УК-4.4 Представляет свою точку зрения при деловом общении и в публичных выступлениях Знать: УК-4.4/Зн1 Лексический минимум в объеме 2000 лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников Уметь: УК-4.4/Ум1 Осуществлять коммуникацию с зарубежными партнерами; переводить научно-техническую литературу по вопросами, связанным с профессиональной деятельностью Владеть: УК-4.4/Нв1 Компенсаторными умениями, помогающими преодолеть "сбои" в коммуникации, вызванные объективными и субъективными, социокультурными причинами

	Базовый	ИДК УК-4.1 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 Знать: УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников Уметь: УК-4.1/Ум1 Выполнять переводы технических текстов с иностранного языка ИДК УК-4.2 Выполняет перевод профессиональных текстов с иностранного языка на государственный язык РФ и с государственного языка РФ на иностранный Знать: УК-4.2/Зн1 Основные способы работы на языковым и речевым материалом Уметь: УК-4.2/Ум1 Выполнять перевод технических текстов с иностранного языка ИДК УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках Знать: УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребительного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи Уметь: УК-4.3/Ум1 Осуществляет коммуникацию с зарубежными партнерами; переводит научно-техническую литературу, связанную с профессиональной деятельностью

		ИДК УК-4.4 Представляет свою точку зрения при деловом общении и в публичных выступлениях Знать: УК-4.4/Зн1 Лексический минимум в объеме 2000 лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников Уметь: УК-4.4/Ум1 Осуществлять коммуникацию с зарубежными партнерами; переводить научно-техническую литературу по вопросами, связанным с профессиональной деятельностью
	Пороговый	ИДК УК-4.1 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 Знать: УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников ИДК УК-4.2 Выполняет перевод профессиональных текстов с иностранного языка на государственный язык РФ и с государственного языка РФ на иностранный Знать: УК-4.2/Зн1 Основные способы работы на языковым и речевым материалом ИДК УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках Знать: УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребительного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи

		ИДК УК-4.4 Представляет свою точку зрения при деловом общении и в публичных выступлениях Знать: УК-4.4/Зн1 Лексический минимум в объеме 2000 лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников

3. Шкала оценивания

Оценка	Критерии оценивания (перечень сформированных ИДК/ЗУВ)
Отлично	УК-4.1 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 УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников УК-4.1/Ум1 Выполнять переводы технических текстов с иностранного языка УК-4.1/Нв1 Навыками чтения, аудирования, разговорной речи, письмо в профессиональной области УК-4.2 Выполняет перевод профессиональных текстов с иностранного языка на государственный язык РФ и с государственного языка РФ на иностранный УК-4.2/Зн1 Основные способы работы на языковым и речевым материалом УК-4.2/Ум1 Выполнять перевод технических текстов с иностранного языка УК-4.2/Нв1 Приемами самостоятельной работы с языковым материалом с использованием справочной и учебной литературы УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребительного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи УК-4.3/Ум1 Осуществляет коммуникацию с зарубежными партнерами; переводит научно-техническую литературу, связанную с профессиональной деятельностью УК-4.3/Нв1 Стратегиями проведения сопоставительного анализа факторов культуры различных стран

	УК-4.4 Представляет свою точку зрения при деловом общении и в публичных выступлениях УК-4.4/Зн1 Лексический минимум в объеме 2000 лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников УК-4.4/Ум1 Осуществлять коммуникацию с зарубежными партнерами; переводить научно-техническую литературу по вопросами, связанным с профессиональной деятельностью УК-4.4/Нв1 Компенсаторными умениями, помогающими преодолеть "сбои" в коммуникации, вызванные объективными и субъективными, социокультурными причинами
Хорошо	УК-4.1 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 УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников УК-4.1/Ум1 Выполнять переводы технических текстов с иностранного языка УК-4.2 Выполняет перевод профессиональных текстов с иностранного языка на государственный язык РФ и с государственного языка РФ на иностранный УК-4.2/Зн1 Основные способы работы на языковым и речевым материалом УК-4.2/Ум1 Выполнять перевод технических текстов с иностранного языка УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребительного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи УК-4.3/Ум1 Осуществляет коммуникацию с зарубежными партнерами; переводит научно-техническую литературу, связанную с профессиональной деятельностью УК-4.4 Представляет свою точку зрения при деловом общении и в публичных выступлениях УК-4.4/Зн1 Лексический минимум в объеме 2000 лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников УК-4.4/Ум1 Осуществлять коммуникацию с зарубежными партнерами; переводить научно-техническую литературу по вопросами, связанным с профессиональной деятельностью
Удовлетворительно	УК-4.1 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 УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников

	УК-4.2 Выполняет перевод профессиональных текстов с иностранного языка на государственный язык РФ и с государственного языка РФ на иностранный УК-4.2/Зн1 Основные способы работы на языковым и речевым материалом УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребительного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи УК-4.4 Представляет свою точку зрения при деловом общении и в публичных выступлениях УК-4.4/Зн1 Лексический минимум в объеме 2000 лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников
Неудовле-творительно	Результаты обучения не сформированы на достаточном уровне
Оценка	Критерии оценивания (перечень сформированных ИДК/ЗУВ)
Зачтено	УК-4.1 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 УК-4.1/Зн1 Лексический минимум в объеме 2000 учебных лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников УК-4.2 Выполняет перевод профессиональных текстов с иностранного языка на государственный язык РФ и с государственного языка РФ на иностранный УК-4.2/Зн1 Основные способы работы на языковым и речевым материалом УК-4.3 Ведет деловую коммуникацию в письменной и электронной форме, учитывая особенности стилистики официальных и неофициальных писем, социокультурные различия в формате корреспонденции на государственном и иностранном (-ых) языках УК-4.3/Зн1 Нормы произношения, лексику иностранного языка общеупотребительного, терминологического и профессионального содержания; типовые способы построения высказываний в устной и письменной речи УК-4.4 Представляет свою точку зрения при деловом общении и в публичных выступлениях УК-4.4/Зн1 Лексический минимум в объеме 2000 лексических единиц общего и терминологического характера, необходимого для возможности получения информации профессионального содержания из зарубежных источников
Не зачтено	Результаты обучения не сформированы на достаточном уровне

4. Контрольные мероприятия по дисциплине

Вид контроля	Форма контроля/Оценочное средство

Текущий контроль	Практическая работа Реферат
Промежуточная аттестация	Реферат Зачет Экзамен

№ п/п	Наименование раздела	Контролируемые ИДК	Вид контроля/ используемые оценочные материалы	
			Текущий	Промежут. аттестация
1	Вводно-коррективный курс	УК-4.1	Практическая работа	Зачет Экзамен
2	Общий курс иностранного языка	УК-4.1 УК-4.2	Практическая работа	Зачет Экзамен
3	Профессионально-ориентированный иностранный язык	УК-4.1 УК-4.2 УК-4.3 УК-4.4	Практическая работа Реферат	Зачет Экзамен

5. Порядок проведения промежуточной аттестации

Порядок проведения промежуточной аттестации регламентируется локальными нормативными актами Университета:

- Положением о формах, периодичности, порядке текущего контроля успеваемости и промежуточной аттестации обучающихся по основным образовательным программам высшего образования – программам бакалавриата, программам специалитета, программам магистратуры в федеральном государственном бюджетном образовательном учреждении высшего образования «Московский государственный университет геодезии и картографии», п.6 «Организация и проведение промежуточной аттестации».
- Положением о порядке осуществления образовательного процесса, проведения текущего контроля успеваемости и промежуточной аттестации обучающихся с применением электронного обучения и дистанционных образовательных технологий в федеральном государственном бюджетном образовательном учреждении высшего образования «Московский государственный университет геодезии и картографии», п.8 «Проведение промежуточной аттестации с применением ЭО и ДОТ».

Промежуточная аттестация: Зачет, 1 семестр.

При проведении промежуточной аттестации применяется среднее арифметическое значение оценок, полученных за каждый элемент оценивания, указанный в билете (ответ на устный вопрос; просмотр текста и ответ на вопрос по нему; полный письменный перевод текста). Итоговая оценка по дисциплине рассчитывается как отношение суммы оценок к количеству полученных оценок (три). При проведении оценивания по вопросам и заданиям, указанным в билете, в ходе промежуточной аттестации преподаватель может учитывать результаты текущего контроля.

Промежуточная аттестация: Зачет, 2 семестр.

При проведении промежуточной аттестации применяется среднее арифметическое значение оценок, полученных за каждый элемент оценивания, указанный в билете (ответ на устный вопрос; просмотр текста и ответ на вопрос по нему; полный письменный перевод текста). Итоговая оценка по дисциплине рассчитывается как отношение суммы оценок к количеству полученных оценок (три). При проведении оценивания по вопросам и заданиям, указанным в билете, в ходе промежуточной аттестации преподаватель может учитывать результаты текущего контроля.

Промежуточная аттестация: Экзамен, 3 семестр.

При проведении промежуточной аттестации применяется среднее арифметическое значение

оценок, полученных за каждый элемент оценивания, указанный в билете (ответ на устный вопрос; просмотр текста и ответ на вопрос по нему; полный письменный перевод текста). Итоговая оценка по дисциплине рассчитывается как отношение суммы оценок к количеству полученных оценок (три). При проведении оценивания по вопросам и заданиям, указанным в билете, в ходе промежуточной аттестации преподаватель может учитывать результаты текущего контроля.

6. Оценочные материалы текущего контроля

Раздел 1. Вводно-коррективный курс
Контролируемые ИДК: УК-4.1

Тема 1.1. Моя биография, семья
Форма контроля/оценочное средство: Практическая работа
Вопросы/Задания:
1. Ответьте на вопрос:
What is your name?
2. Ответьте на вопрос:
How old are you?
3. Ответьте на вопрос:
Where are you from?

Раздел 2. Общий курс иностранного языка
Контролируемые ИДК: УК-4.1 УК-4.2

Тема 2.1. Современная система образования в России, мой институт
Форма контроля/оценочное средство: Практическая работа
Вопросы/Задания:
1. Ответьте на вопрос:
Where do you study?
2. Ответьте на вопрос:
What is the name of your institute (university)?
3. Ответьте на вопрос:
What is your speciality?

Тема 2.2. Проблемы экологии в современном мире.
Форма контроля/оценочное средство: Практическая работа
Вопросы/Задания:
1. Ответьте на вопрос:
Is ecology a big problem today?
2. Ответьте на вопрос:
What pollutes the air in cities?
3. Ответьте на вопрос:
Why is it bad to throw rubbish in the forest or street?

Тема 2.3. Страны изучаемого языка
Форма контроля/оценочное средство: Практическая работа
Вопросы/Задания:
1. Ответьте на вопрос:
What is the official name of Great Britain?

2. Ответьте на вопрос:
What is the capital of the UK?
3. Ответьте на вопрос:
What is the weather like in Britain? (Is it hot or rainy?)

Тема 2.4. . Система высшего образования в США и Великобритании

Форма контроля/оценочное средство: Практическая работа

Вопросы/Задания:

1. Ответьте на вопрос:
What is the difference between a "college" and a "university" in the context of the US and UK education systems?
2. Ответьте на вопрос:
How does the admission process to a university differ between Russia, the UK, and the USA?
3. Ответьте на вопрос:
What are the most prestigious universities in the UK (often called "Oxbridge") and the USA (the "Ivy League")?

Тема 2.5. Россия в современном мире, Москва, мой родной город.

Форма контроля/оценочное средство: Практическая работа

Вопросы/Задания:

1. Ответьте на вопрос:
What are the main types of mineral resources that Russia is rich in, and where are they mostly located (e.g., in Siberia)?
2. Ответьте на вопрос:
Russia is the largest country in the world. Where is it situated, and what oceans border its territory?
3. Ответьте на вопрос:
The climate in Russia is very diverse. How does it differ from the European part to the Far East?

Раздел 3. Профессионально-ориентированный иностранный язык

Контролируемые ИДК: УК-4.1 УК-4.2 УК-4.3 УК-4.4

Тема 3.1. Моя специальность: Современное состояние изучаемой науки, технологии.

Форма контроля/оценочное средство: Практическая работа

Вопросы/Задания:

1. Ответьте на вопрос:
How has the introduction of GPS/GLONASS technologies changed the profession of a surveyor?
2. Ответьте на вопрос:
What is GIS (Geographic Information System), and what are its main applications in modern life?
3. Ответьте на вопрос:
In what areas is modern geodesy applied? (e.g., construction, mining, archaeology, creating digital maps).

Тема 3.2. Моя специальность: История изучаемой науки и видные ученые

Форма контроля/оценочное средство: Практическая работа

Вопросы/Задания:

1. Ответьте на вопрос:
Can you name a famous Russian scientist who made a significant contribution to the development of geodesy or cartography (e.g., in the exploration of Siberia)?
2. Ответьте на вопрос:
Who is considered to be the "father of geography" in Ancient Greece, and what was his major work?

3. Ответьте на вопрос:
How did people measure distances and create maps before the invention of modern technology?

Форма контроля/оценочное средство: Реферат

Вопросы/Задания:

1. Подготовьте реферат на тему "Development of Geodesy", ответив на вопросы ниже:
1. How did ancient people measure land without modern tools?
2. What instruments did geodesists use in the 19th century?
3. How did the invention of the telescope change geodesy?
4. Why was it difficult to make accurate maps in the past?
5. How have satellites changed the work of a geodesist?

2. Подготовьте реферат на тему: " Earth Sciences", ответив на вопросы ниже:
1. What is the Earth made of inside?
2. Why do earthquakes and volcanoes happen?
3. How was the map of the world created?
4. What is the water cycle and why is it important?
5. How do scientists study the climate of the past?

3. Подготовьте реферат на тему: "Geodesy and Remote Sensing ", ответив на вопросы ниже:
1. What is remote sensing?
2. How do satellites take pictures of the Earth?
3. What can we see from space that we cannot see from the ground?
4. How do drones help to create maps?
5. Why is remote sensing useful for ecologists?

4. Подготовьте реферат на тему: " Geographic Information Systems (GIS)", ответив на вопросы ниже:
1. What is GIS and how does it work?
2. How are digital maps different from paper maps?
3. How do navigation apps (like Google Maps) work?
4. Where can GIS be used in a modern city?
5. Why do people say that GIS is a powerful tool for analysis?

5. Подготовьте реферат на тему: " Global Navigation Satellite Systems (GNSS / GPS)", ответив на вопросы ниже:
1. What is GPS and how does it know where you are?
2. What is the difference between GPS and GLONASS?
3. How many satellites do we need to find a location?
4. Why is GPS sometimes not accurate?
5. What professions use GPS every day?

7. Оценочные материалы промежуточной аттестации

1 семестр, Зачет

Контролируемые ИДК: УК-4.1 УК-4.2 УК-4.3 УК-4.4

Вопросы/Задания:

1. Переведите предложения на английский язык.
Мой дядя – ученый.

2. Переведите предложения на английский язык.
Я родом из Бразилии.

3. Переведите предложения на английский язык.
Супермаркет находится недалеко от нашего дома.

4. Переведите предложения на английский язык.
Джон не был голоден.

5. Переведите предложения на английский язык.
Мы болеем.

6. Переведите предложения на английский язык.
Дети были в школе

7. Переведите предложения на английский язык.
Ключи будут на столе.

8. Переведите предложения на английский язык.
Билеты не будут дешевыми.

9. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке
He (to work) every day

10. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке
She (to listen to) music for two hours

11. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке
Vegetables (to buy) by them every evening

12. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке
You (to play) soccer on Fridays?

13. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке
The flowers (to water) by her every morning?

14. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке
They (not to buy) anything two days ago

15. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке
The car (to repair) yesterday by him

16. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке
The shops (not to close) by them two days ago

17. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке
They (not to read) tomorrow

18. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке
The war (to stop) by them next year

19. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке
They (to build) the bridge now

20. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке
The chairs (to sell) by them at the moment

21. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке
When I saw them, they (to walk) in the park

22. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке
I just (to finish) my report

23. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке

The work already (to do) by him

24. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке

You (to invite) already by them?

25. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке

By the time he got to the bus stop, the bus (to go) already

26. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке

I (to finish) this work by next Friday

27. Раскройте скобки, соблюдая правила построения утверждений, отрицаний и вопросов во всех временах и залогах в английском языке

The letter (to deliver) by next morning

28. Откройте скобки, поставив глаголы в правильную форму страдательного залога

I can't give you these articles. They (translate) now.

29. Откройте скобки, поставив глаголы в правильную форму страдательного залога

English (speak) all over the world.

30. Откройте скобки, поставив глаголы в правильную форму страдательного залога

My dress is clean now. It (wash).

31. Откройте скобки, поставив глаголы в правильную форму страдательного залога

These houses (build) in 1500.

32. Откройте скобки, поставив глаголы в правильную форму страдательного залога

This film (discuss) at the next lesson.

33. Откройте скобки, поставив глаголы в правильную форму страдательного залога

Wait a little! Your question (receive) by next Sunday.

34. Откройте скобки, поставив глаголы в правильную форму страдательного залога

The UK (wash) by the Atlantic Ocean and the North Sea.

35. Откройте скобки, поставив глаголы в правильную форму страдательного залога

Rugby (play) since 1845.

36. Откройте скобки, поставив глаголы в правильную форму страдательного залога

All the questions on the paper must (answer).

2 семестр, Зачет

Контролируемые ИДК: УК-4.1 УК-4.2 УК-4.3 УК-4.4

Вопросы/Задания:

1. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

The flag of the UK is known as the Union Jack. It has its history. It all began in 1603 when Scotland was joined to England and Wales. The flag is made up of 3 crosses. The upright cross is the Cross of St. Jeorge the patron saint of England. The white diagonal cross is the cross of St. Andrew, the patron saint of Scotland. The red diagonal cross is the cross is the cross of St. Patrick, the patron saint of Ireland. All of them are on the blue background. The national anthem is . The national currency is pound. Geographically the island of Great Britain is subdivided into 2 main regions: Lowland Britain and Highland Britain. Lowland Britain comprises southern and eastern England. Highland Britain consists of Scotland, most of Wales, the Pennines (or the Pennine Chain) and the Lake District. The highest mountain top is Ben Nevis in Scotland. The chief rivers of Great Britain are: the Severn, separating England and Wales, the Thames (the longest and the deepest one). The swiftest flowing river is the Spray. Also the Tweed is famous (the woolen fabric is made here). Every country in the UK has its own national emblem. The red rose is the national emblem of England, the

thistle is the national emblem of Scotland, the daffodils and the leek are the emblems of Wales, and the shamrock (a kind of clover) is the emblem of Ireland.

2. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

The United Kingdom is a constitutional monarchy. It has a monarch - a King or a Queen. The present British monarch is Queen Elizabeth the Second. She become Queen in 1952. The monarch has little power and can reign with the support of Parliament. British Parliament is the legislative body at the country. It consists of two Houses. The House of Commons and House of Lords. Parliament and the monarch have different roles in the Government of the country. In reality, the House of Commons has truth power. It introduces new bills. Then they go to the House of Lords for approval. The functions of the Queen are: to open the sessions of the Parliament, to head the commonwealth, to be Commander-in-Chief, to declare the war, to make peace. The house of commons is made up of 650 elected knows of members of parliament. The party which has the majority of suits in the Government and its leader usually becomes prime minister. The prime minister forms his or her Cabinet Ministers. The chairman of the House of Commons is the Speaker. The chairman of the House of Lords is the Lord Chancellor. He sits on a special place, which is called the woolsack. It means that wool made England rich. The members of the House of Lords are not elected, there are live peers. There are several political parties in Great Britain. They are the Conservative, the Liberal, the Labor, the Social Democratic and the Communist parties. Prime minister of the country Boris Johnson is leader of the Conservative Party.

3. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

Siberia, in the north of Russia, is one of the coldest, harshest places on earth. Famed for its inhospitable climate, it is also mineral-wealthy and unexploited – a true frontier region. Although it has attracted mining companies for decades, the challenging landscape and conditions have meant they have only just begun to scratch the surface of the area's potential.

This could now be changing; as climate change leads to warmer temperatures, ice and permafrost are melting and potentially easing the mining process. The mining sector is the second biggest contributor to GDP in Russia, and is expected to continue to play an important role in its economy.

Mining in Siberia grew exponentially during the 20th century, as successive governments and leaders sought to take advantage of it. "The Siberian region is rich in minerals including coal, gold, diamond and iron ore," says Globaldata analyst Alok Shukla. "Coal is largely extracted from Kemerovo, Krasnoyarsk Krai, Sakha (Yakutia), Republic of Khakassia, and Irkutsk Oblast. Gold originates mainly from Krasnoyarsk Krai and Irkutsk Oblast."

Russia is responsible for 7% of global aluminium production, and 95% of this takes place in Siberia. It is home to Russia's largest coal mine, the Arshanovsky pit in the Khakassia Republic which opened in 2015. When at full capacity it is expected to produce 10 million tonnes of coal, and there are already plans to expand it further. Siberia and the Far East also hold 84% of Russia's known gold reserves.

But much remains unexplored or inaccessible in Siberia still, leaving the true mineral wealth of the region uncertain. In 2016, a mineral was discovered in Siberia unlike any ever found naturally occurring on earth. Instead it appears to be similar to lab-grown metal-organic frameworks. Such discoveries highlight the potential of a region so long hidden under ice and thick forests.

4. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

In recent years, climate change has been a much talked about issue, with many debates over its possible impact on the world, and some even going so far as to question its very existence. However, with the undeniable increase in greenhouse emissions on Earth, there can be no doubt that the earth is becoming warmer.

So what exactly does this mean for the future of our planet? In chilly places like the UK, we may think to ourselves: 'Finally, warmer weather!' But global warming will in fact cause extreme weather conditions, meaning that our winters would be even colder than they are now. More than that, warmer temperatures will lead to the melting of ice in the north and south poles, which in turn will lead to rising sea levels across the globe. This is particularly troubling for low coastal regions such as

Florida in the USA which would be among the first to be flooded, along with many islands around the world, including the United Kingdom. In 1000 years or so, all these places and more will be submerged underwater.

So where will be able to live? Unless we can find a way to evolve into mermaids and mermen, which doesn't look promising, the only solution is to move elsewhere. There will be little choice left once a large proportion of the land is lost to the sea, and other remaining places will be so hot that they will be absolutely impossible to survive in. It is possible, then, that the once frozen poles of the Arctic and Antarctica will be suitable enough to live in, having melted its ice and warmed up.

It's a scary thought to imagine such devastation on Earth. Perhaps if people start to realize how their actions now can have such a profound impact on future generations, they will change their attitude and start to think more about caring for the environment, in order to save it.

5. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

Inland Weather in Wales

The higher you get in Wales, the colder and wetter it gets. And as you move away from the coasts, Wales is quilted with river valleys separated by increasingly higher hills. The Brecon Beacons in south Wales, are softly rolling but enormous, windswept hills where winter temperatures below freezing and snowfalls are not uncommon. Further north, in the inland mountains of Snowdonia National Park, heavy precipitation can be extreme. One mountain peak, Crib Goch, may be the wettest place in the entire country with an astonishing 176 inches of rainfall annually.2 And on the highest peaks, it snows a great deal.

Mount Snowdon, at 3,560 feet and the highest U.K. mountain south of Scotland, can experience snowfall from October to May.

Snowfall at lower altitudes is rare, with an average of only 10 days a year with snow lying on the ground in the south and west Wales. On the other hand, the mountains of Snowdonia average 30 days a year with snowfall lying on the ground.

Autumn and Winter in Wales

In September, temperatures linger in the 60s but fall away rapidly through October and November into the high 40s. January and February are the coldest months with temperatures hovering around freezing or slightly above in higher areas and in the high 40s along the coast. Temperatures at night are usually 10 to as much as 15 degrees Fahrenheit colder depending on where you are in the country.

October through January are the wettest months. Rain tends to fall in short, sharp and very heavy showers. November is particularly squally with rain accompanied by gusty winds.

6. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

Scotland is a country in the north of Great Britain. It is a part of the United Kingdom. Scotland is divided into three natural regions: the Southern Uplands, the Central Lowlands and the Highlands and islands. A lot of places in Scotland are a natural paradise, still untouched by man.

The capital of Scotland is Edinburgh, well known for its castle. Glasgow is the industrial capital of Scotland. It is the third largest city in Great Britain. The typical products of Scotland are timber, whisky, salmon. Golf is the Scottish natural sport and it seems to have originated in this country.

Scotland is also the land of myths and mysteries; every castle has its ghost. Glamis Castle is said to have nine of them. And of course everyone knows about the Loch Ness Monster. 'Nessie" is said to be about six meters long, with a long, thin neck. The first report of the monster in Loch Ness was in 565 A.D. Since 1934, thousands of people claimed to they had seen the monster. Scientists have investigated the Loch and taken pictures but no scientific explanation of the mystery has been given.

Scotland is the north part of Great Britain. Five million people live in Scotland. Edinburgh is the capital of Scotland.

7. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

The London Eye, or the Millennium Wheel, is a cantilevered observation wheel on the South Bank of the River Thames in London. It is Europe's tallest cantilevered observation wheel, and is the most popular paid tourist attraction in the United Kingdom with over 3 million visitors annually. It has

made many appearances in popular culture.
The structure is 135 metres (443 ft) tall and the wheel has a diameter of 120 metres (394 ft). When it opened to the public in 2000 it was the world's tallest Ferris wheel. Its height was surpassed by the 167 metres (548 ft) High Roller (Las Vegas) in 2014. Supported by an A-frame on one side only, unlike the taller Nanchang and Singapore wheels, the Eye is described by its operators as "the world's tallest cantilevered observation wheel".
The London Eye used to offer the highest public viewing point in London until it was superseded by the 245-metre-high (804 ft) observation deck on the 72nd floor of The Shard, which opened to the public on 1 February 2013.
In March 2020, the London Eye celebrated its 20th birthday by turning several of its pods into experiences themed around London, in partnership with its sponsor lastminute.com. The special experiences included a pub in a capsule, a west end theatre pod and a garden party with flower arrangements to represent the eight London Royal parks.

8. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

The Shard, located in London, is one of the most iconic skyscrapers in the United Kingdom and a prominent feature of the city’s skyline. Completed in 2012, it was designed by the renowned architect Renzo Piano and stands at a height of 310 meters (1,016 feet), making it the tallest building in the UK and the fifth tallest in Europe. The Shard's unique design resembles a shard of glass, with its tapering form and reflective façade that changes appearance with the weather and time of day.
The construction of The Shard began in 2009 and was part of a larger redevelopment project for London Bridge Station and its surrounding area. The building consists of 95 floors, with a mix of office space, restaurants, a hotel, and residential apartments. The top floors house an observation deck known as "The View from The Shard," which offers breathtaking panoramic views of London and beyond, attracting millions of visitors each year.
One of the most notable features of The Shard is its innovative use of glass. The façade is made up of 11,000 glass panels that create a shimmering effect, allowing natural light to flood the interior spaces while providing stunning views for those inside. The building is also designed with sustainability in mind; it incorporates energy-efficient systems and has achieved a BREEAM rating for its environmental performance.
The Shard has become a symbol of modern London and is often featured in films, television shows, and promotional materials for the city. Its presence has also spurred further development in the surrounding area, contributing to London's status as a global financial hub.
In addition to its architectural significance, The Shard has played host to various cultural events and exhibitions since its opening. It has become a popular venue for corporate events, weddings, and private functions due to its stunning views and luxurious amenities.
Overall, The Shard represents not only an architectural achievement but also a testament to London's ongoing evolution as a vibrant metropolis. Its striking design and multifunctional use make it an essential part of the city's landscape and an enduring attraction for both locals and tourists alike.

9. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

As one of the world’s leading cities, London is at the forefront of addressing climate change and environmental sustainability. The Greater London Authority (GLA) has set an ambitious target to achieve net-zero carbon emissions by 2030. This goal reflects a commitment to creating a cleaner, healthier, and more sustainable urban environment for current and future generations.
Understanding the Zero Carbon Target
The zero carbon target means that London aims to balance the amount of greenhouse gases emitted with the amount removed from the atmosphere. This involves reducing emissions across various sectors, including transportation, buildings, energy production, and waste management. The target is not just about reducing carbon footprints but also about fostering resilience against climate impacts.
To achieve its zero carbon goal, London is implementing strategies across several key areas:
Energy Efficiency in Buildings: A significant portion of London’s emissions comes from buildings. The GLA is promoting retrofitting existing structures to improve energy efficiency and encouraging new developments to meet stringent sustainability standards. Initiatives include the London Plan,

which mandates higher energy performance standards for new buildings.
Renewable Energy Transition: Increasing the use of renewable energy sources is crucial for reducing carbon emissions. London aims to expand solar energy installations, wind power projects, and other renewable technologies. The city is also exploring community energy schemes that empower residents to generate and share renewable energy.
Sustainable Transport: Transportation is another major contributor to London's carbon footprint. The city is investing in public transport infrastructure, expanding cycling networks, and promoting electric vehicles (EVs). Initiatives like the Ultra Low Emission Zone (ULEZ) aim to reduce air pollution and encourage cleaner modes of transport.
Waste Management: Reducing waste and increasing recycling rates are essential components of London's sustainability strategy. The city is working towards a circular economy model that minimizes waste generation and maximizes resource recovery through recycling and composting programs.
Innovation and Technology
London recognizes that innovation plays a critical role in reaching its zero carbon goal. The city is investing in smart technologies that enhance energy efficiency and reduce emissions. This includes smart grids for better energy management, data analytics for optimizing transport systems, and digital platforms that facilitate sustainable practices among residents.

London's zero carbon target represents a bold vision for a sustainable future—a future where economic growth does not come at the expense of environmental health. By prioritizing energy efficiency, renewable energy adoption, sustainable transport solutions, waste reduction strategies, community engagement, and technological innovation, London aims to lead by example in the global fight against climate change. Achieving this ambitious goal will not only benefit the environment but also enhance the quality of life for all Londoners by creating a cleaner, greener city for generations to come.

10. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

The climate of the United Kingdom is characterized by its temperate maritime conditions, which result in relatively mild temperatures, moderate rainfall, and a lack of extreme weather events compared to many other regions. However, the UK is not immune to the impacts of climate change, which pose significant challenges to its environment, economy, and society. Understanding the current climate dynamics and the implications of climate change is crucial for developing effective strategies for mitigation and adaptation.
The UK experiences four distinct seasons, with average temperatures ranging from about 1°C (34°F) in winter to 20°C (68°F) in summer. Rainfall is distributed fairly evenly throughout the year, with some regions, particularly in the west and north, receiving significantly more precipitation than others. The climate varies across the country:
Southern England: Generally warmer and drier, with milder winters.
Northern England and Scotland: Cooler temperatures and higher rainfall.
Coastal Areas: Influenced by maritime conditions, leading to milder winters but also increased vulnerability to storms and flooding.
The effects of climate change are becoming increasingly evident in the UK:
Rising Temperatures: Average temperatures have increased by approximately 1°C since the late 19th century. This trend is expected to continue, leading to hotter summers and milder winters.
Increased Rainfall and Flooding: While overall rainfall may not significantly increase, extreme weather events are becoming more frequent. Heavy rainfall can lead to flooding, particularly in urban areas with inadequate drainage systems.
Sea Level Rise: Coastal areas are at risk due to rising sea levels caused by melting ice caps and thermal expansion of seawater. This threatens communities, infrastructure, and ecosystems along the coast.
Biodiversity Loss: Changing climates can disrupt ecosystems and habitats, leading to shifts in species distribution and increased risks for native wildlife.
Climate Adaptation Strategies: The government is developing strategies to adapt to climate impacts through improved infrastructure resilience, flood defenses, and sustainable land management

practices.
Investment in Renewable Energy: The UK has made significant strides in transitioning to renewable energy sources such as wind (both onshore and offshore), solar power, and biomass. This shift aims to reduce reliance on fossil fuels and lower carbon emissions.
Local communities play a vital role in addressing climate change. Initiatives such as community-led renewable energy projects, tree planting campaigns, and local sustainability programs empower residents to take action at a grassroots level. Public awareness campaigns also aim to educate citizens about their carbon footprints and encourage sustainable practices.
The UK's climate presents both challenges due to the impacts of climate change and opportunities for innovation towards a sustainable future. By committing to ambitious targets like net-zero emissions, investing in renewable energy sources, engaging communities in sustainability efforts, and adapting infrastructure for resilience against extreme weather events, the UK aims not only to mitigate its own environmental impact but also to serve as a global leader in addressing one of humanity's most pressing issues—climate change. As these efforts continue to evolve, they will shape the future landscape of both the environment and society across the nation.

11. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

The population of the United Kingdom (UK) is a dynamic and diverse entity, reflecting a rich tapestry of cultures, ethnicities, and histories. As of 2023, the estimated population stands at approximately 67 million people, making the UK one of the most populous countries in Europe. Understanding the demographic trends and characteristics of the UK population is essential for addressing social, economic, and political challenges.
The UK is characterized by its multicultural society. The population includes a wide range of ethnic groups, with White British being the largest demographic, followed by significant communities of South Asian, Black, Mixed, and other ethnic backgrounds. Major cities like London, Birmingham, Manchester, and Leicester are particularly known for their cultural diversity. London alone is home to over 300 languages spoken by its residents.
The UK has experienced fluctuating population growth rates over the years. Following a period of steady growth in the early 21st century, recent trends indicate a slowdown in growth due to various factors such as declining birth rates and changes in immigration patterns. The fertility rate in the UK has fallen below the replacement level of 2.1 children per woman, leading to concerns about an aging population.
One of the most significant demographic challenges facing the UK is its aging population. Advances in healthcare and living standards have contributed to increased life expectancy, which currently averages around 81 years. As a result, the proportion of older adults (aged 65 and over) is rising rapidly. This shift presents challenges for healthcare services, pensions, and social care systems as they adapt to meet the needs of an older demographic.
Migration has played a crucial role in shaping the UK’s population dynamics. Historically a destination for immigrants seeking better opportunities, recent years have seen changes in migration patterns due to political events such as Brexit and global crises like the COVID-19 pandemic. While net migration has fluctuated, it remains a vital component of population growth and contributes to workforce diversity.
The population of the United Kingdom is characterized by its diversity and complexity. As it navigates challenges such as an aging demographic and changing migration patterns, understanding these dynamics will be crucial for shaping effective policies that promote social cohesion and economic stability. By embracing its multicultural identity while addressing regional disparities and demographic shifts, the UK can work towards a future that benefits all its residents.

12. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

The economy of the United Kingdom (UK) is one of the largest and most developed in the world, characterized by a diverse range of industries, a strong services sector, and a significant global presence. As of 2023, the UK economy is recovering from the impacts of the COVID-19 pandemic and navigating challenges such as inflation, supply chain disruptions, and geopolitical uncertainties.
The UK economy is primarily service-oriented, with services accounting for approximately 80% of

GDP. Key sectors include finance, healthcare, education, retail, and tourism. London serves as a global financial hub, hosting numerous banks, investment firms, and insurance companies. The City of London and Canary Wharf are central to this financial activity, attracting international investment and talent.

Manufacturing remains an important part of the economy, contributing around 10% to GDP. The UK has a strong manufacturing base in industries such as aerospace, automotive, pharmaceuticals, and food production. Despite facing challenges from globalization and competition, British manufacturers continue to innovate and adapt to changing market demands.

The UK is a significant player in international trade. It exports goods and services worth hundreds of billions annually, with major trading partners including the European Union (EU), the United States, China, and Japan. Key exports include machinery, vehicles, pharmaceuticals, and financial services.

Post-Brexit trade dynamics have shifted as the UK navigates new trade agreements outside the EU framework. The government has sought to establish free trade agreements with various countries to enhance market access for British businesses.

Despite its strengths, the UK economy faces several challenges:

Inflation: Rising inflation rates have impacted consumer purchasing power and business costs. The Bank of England has responded with monetary policy adjustments to stabilize prices.

Supply Chain Disruptions: Global supply chain issues have affected various sectors, leading to delays in production and increased costs for businesses.

Geopolitical Uncertainties: Ongoing geopolitical tensions can influence trade relationships and economic stability.

The economy of the United Kingdom is marked by its resilience and adaptability in the face of challenges. With a strong services sector at its core and ongoing efforts towards innovation and sustainability, the UK continues to play a vital role in the global economic landscape. As it navigates post-pandemic recovery while addressing inflationary pressures and labor market dynamics, strategic policies will be essential for fostering growth that benefits all segments of society.

13. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

London, the capital city of England and the United Kingdom, boasts a rich and diverse history that spans over two millennia. Its origins can be traced back to the Roman period when it was established as Londinium around AD 43. The Romans recognized the strategic importance of the River Thames for trade and transportation, leading to the rapid growth of the settlement. By the end of the first century, Londinium had developed into a bustling town with a population of around 60,000, complete with a forum, basilica, and defensive walls.

Following the decline of Roman rule in the early 5th century, London experienced a period of instability and fragmentation. The Anglo-Saxons began to settle in the area, and by the 9th century, it had become an important trading hub known as Lundenwic. However, this prosperity was threatened by Viking invasions, leading to the establishment of fortified settlements.

The Norman Conquest in 1066 marked a significant turning point in London's history. William the Conqueror built the Tower of London as a symbol of power and control over the city. The subsequent centuries saw London grow in importance as a political and economic center. The establishment of institutions such as Parliament and the Church further solidified its status.

The medieval period was marked by significant events such as the Black Death in 1348, which decimated London's population but also led to social and economic changes. The city continued to expand during the Tudor period, becoming a cultural hub under monarchs like Henry VIII and Elizabeth I.

The Great Fire of London in 1666 was another pivotal moment that reshaped the city. It destroyed much of medieval London but also provided an opportunity for reconstruction. Sir Christopher Wren played a crucial role in redesigning St. Paul's Cathedral and other buildings that defined London's skyline.

The Industrial Revolution in the 18th and 19th centuries transformed London into one of the world's largest cities. It became a center for finance, trade, and industry, attracting millions from rural areas and abroad. This rapid urbanization brought challenges such as overcrowding and pollution but also led to advancements in infrastructure, including railways and public transport.

The 20th century saw London endure two World Wars, which caused significant destruction but also fostered resilience among its inhabitants. Post-war reconstruction efforts led to modernization while preserving historical landmarks.
Today, London is a vibrant global city known for its cultural diversity, economic significance, and historical heritage. From its Roman roots to its status as a modern metropolis, London's history is a testament to its ability to adapt and thrive through centuries of change.

14. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

Moscow, the capital city of Russia, has a rich and complex history that dates back to its founding in the 12th century. The city was first mentioned in historical records in 1147 when Prince Yuri Dolgoruky invited other princes to a feast. Initially, Moscow was a small settlement on the banks of the Moskva River, but its strategic location made it an important center for trade and politics.
In the late 13th century, Moscow began to rise in prominence under the leadership of Prince Ivan I, also known as Ivan Kalita. He managed to consolidate power and expand the territory, establishing Moscow as a significant principality. The city became the center of the Russian Orthodox Church after the fall of Kiev to the Mongols in 1240, further enhancing its influence.
The Mongol invasion in the 13th century led to several decades of domination known as the "Tatar Yoke." Despite this oppression, Moscow gradually gained strength and autonomy. By the late 15th century, under Grand Prince Ivan III (Ivan the Great), Moscow successfully overthrew Mongol rule and expanded its territory significantly. Ivan III also initiated major construction projects, including the Kremlin's stone walls and towers, which still stand today.
The 16th century saw the rise of Ivan IV (Ivan the Terrible), who was crowned as Russia's first tsar in 1547. His reign marked both expansion and turmoil; while he expanded Russian territory into Siberia, his later years were characterized by paranoia and violence, leading to a period of instability after his death in 1584.

The Time of Troubles (1598-1613) followed, marked by political chaos and foreign intervention. This period ended with the establishment of the Romanov dynasty in 1613, which would rule Russia for over three centuries. Under Peter the Great in the late 17th and early 18th centuries, Moscow faced competition from St. Petersburg as a political center but remained culturally significant.
The 19th century brought significant changes with industrialization and social upheaval. The Decembrist revolt in 1825 highlighted growing discontent among Russian elites. The city also played a crucial role during events such as Napoleon's invasion in 1812 when much of Moscow was burned to prevent French forces from using it.
The early 20th century was marked by revolutionary fervor. The Bolshevik Revolution in 1917 led to significant political changes; Moscow became the capital of Soviet Russia and later the Soviet Union. Under communist rule, extensive urban development transformed Moscow into a symbol of Soviet power.
After World War II, Moscow emerged as a global superpower's capital during the Cold War era. The city continued to grow economically and culturally despite facing challenges such as political repression.
With the dissolution of the Soviet Union in 1991, Moscow underwent significant transformations as Russia transitioned towards a market economy. Today, it stands as a vibrant metropolis known for its rich history, diverse culture, and economic significance on both national and global stages.

15. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

Three Famous Places in London

London, a city steeped in history and culture, is home to numerous iconic landmarks. Among them, the Tower of London, Buckingham Palace, and the British Museum stand out as must-visit destinations that reflect the city’s rich heritage.

1. The Tower of London

The Tower of London, a UNESCO World Heritage Site, is one of the most famous historical landmarks in the city. Founded by William the Conqueror in 1066, this imposing fortress has served various roles throughout its history, including royal palace, prison, and treasury. The Tower is

perhaps best known for housing the Crown Jewels, a stunning collection of royal regalia that includes crowns, scepters, and other ceremonial items. Visitors can explore its medieval architecture, learn about its storied past through guided tours led by the Yeoman Warders (commonly known as Beefeaters), and hear tales of intrigue and imprisonment associated with figures like Anne Boleyn and Sir Thomas More.

2. Buckingham Palace

Buckingham Palace serves as the official residence of the British monarch and is an enduring symbol of the British monarchy. Originally built in 1703 as a townhouse for the Duke of Buckingham, it became a royal residence in 1837 when Queen Victoria ascended to the throne. The palace features 775 rooms and is surrounded by beautiful gardens. One of its most popular attractions is the Changing of the Guard ceremony, which takes place daily during summer and every other day during winter. Visitors can also tour the State Rooms during certain months when they are open to the public, offering a glimpse into royal life and opulence.

3. The British Museum

The British Museum is one of the world's oldest and most comprehensive museums dedicated to human history and culture. Established in 1753, it houses an extensive collection of over eight million works from various civilizations across the globe. Highlights include the Rosetta Stone, which was key to deciphering Egyptian hieroglyphs; the Elgin Marbles from the Parthenon; and mummies from ancient Egypt. The museum's architecture is equally impressive, featuring a stunning glass-roofed Great Court that provides a modern contrast to its historic galleries. Admission to the museum is free, making it accessible to millions who come to explore its vast array of artifacts.

16. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

The Center of London: A Vibrant Hub of Culture and History

The center of London is a bustling metropolis that serves as the heart of the United Kingdom's capital. This area is not only a financial powerhouse but also a cultural epicenter, rich in history and diversity. Spanning several boroughs, including Westminster and the City of London, the central area is home to iconic landmarks, world-class museums, and vibrant neighborhoods.

One of the most recognizable features of central London is its historic architecture. The Houses of Parliament, with the iconic Big Ben (now known as the Elizabeth Tower), stands majestically along the River Thames. This Gothic Revival masterpiece is not only a symbol of British democracy but also a UNESCO World Heritage Site. Nearby, Westminster Abbey has been the site of royal ceremonies for centuries, including coronations and weddings, making it a significant religious and historical landmark.

Just a short walk away lies Trafalgar Square, a lively public space that commemorates Admiral Nelson's victory at the Battle of Trafalgar. The square is adorned with the impressive Nelson's Column and is surrounded by notable institutions such as the National Gallery, which houses an extensive collection of European paintings. This area often hosts events and gatherings, making it a focal point for both locals and tourists.

Shopping enthusiasts flock to Oxford Street, one of Europe's busiest shopping streets, featuring over 300 shops ranging from high-street brands to luxury boutiques. Nearby Regent Street offers a more upscale shopping experience with its elegant architecture and flagship stores. For those seeking a more eclectic vibe, Covent Garden provides a mix of shops, street performances, and dining options in a charming setting.

Cultural experiences abound in central London. The West End is renowned for its theaters showcasing world-class productions ranging from classic plays to contemporary musicals. Visitors can enjoy everything from Shakespearean dramas to modern hits like "The Lion King" or "Hamilton." The area's vibrant nightlife also includes an array of pubs, bars, and restaurants offering diverse cuisines from around the globe.

Central London is well-connected by an extensive public transport system that includes buses and the iconic London Underground (the Tube). This accessibility makes it easy for visitors to explore various neighborhoods such as Soho, known for its lively atmosphere and nightlife; Chinatown, with its authentic Asian cuisine; and Southbank, which offers stunning views along the Thames River.

In addition to its historical significance and cultural offerings, central London is also home to green spaces like Hyde Park and St. James's Park. These parks provide a tranquil escape from the urban

hustle and bustle where visitors can relax or enjoy outdoor activities.
In summary, the center of London is a dynamic blend of history, culture, shopping, and entertainment. Its iconic landmarks tell stories of Britain's past while contemporary attractions reflect its vibrant present. Whether you're exploring historic sites or indulging in modern experiences, central London offers something for everyone—a true testament to its status as one of the world's great cities.

17. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

The center of Moscow is a vibrant and bustling area that serves as the heart of Russia's capital. Known for its rich history, stunning architecture, and cultural significance, this part of the city attracts millions of visitors each year. The blend of historical landmarks and modern developments creates a unique atmosphere that reflects both the past and the present.
At the core of Moscow lies the iconic Red Square, one of the most famous squares in the world. This UNESCO World Heritage Site is surrounded by remarkable structures, including the colorful St. Basil's Cathedral with its distinctive onion domes, which has become a symbol of Russia itself. The square also features the imposing walls of the Kremlin, a fortified complex that serves as the official residence of the President of Russia. The Kremlin is home to several palaces and cathedrals, showcasing stunning examples of Russian architecture and art.
Adjacent to Red Square is Lenin's Mausoleum, where visitors can pay their respects to the founder of the Soviet Union. The mausoleum stands as a reminder of Russia's tumultuous history and its impact on contemporary society. Nearby, GUM (Glavny Universalny Magazin), a historic department store with an elegant glass roof, offers a luxurious shopping experience with high-end boutiques and cafes.
Moscow's central area is also known for its impressive metro system, often referred to as one of the most beautiful in the world. Many metro stations are adorned with intricate mosaics, chandeliers, and sculptures that reflect Soviet-era art and design. Stations like Komsomolskaya and Mayakovskaya are particularly noteworthy for their stunning aesthetics.
Cultural experiences abound in central Moscow. The Bolshoi Theatre is renowned for its ballet and opera performances, attracting art lovers from around the globe. Just a short walk away lies Tverskaya Street, one of Moscow's main thoroughfares lined with shops, restaurants, and theaters. This bustling street epitomizes modern Moscow while still retaining elements of its historical charm.
For those seeking green spaces amidst the urban landscape, Gorky Park offers a refreshing escape. This expansive park features walking paths, open-air cafes, and recreational activities such as cycling and rollerblading. It serves as a popular gathering place for locals and tourists alike.
The center of Moscow is also home to numerous museums that showcase Russian art and history. The State Tretyakov Gallery houses an extensive collection of Russian fine art from various periods, while the Pushkin State Museum of Fine Arts features works from European masters.
As night falls, central Moscow transforms into a lively hub filled with nightlife options ranging from trendy bars to traditional Russian restaurants offering local cuisine. The illuminated skyline adds to the city's charm as visitors enjoy evening strolls along the Moskva River or through historic streets.

18. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

The Moscow Kremlin is one of the most iconic landmarks in Russia and serves as a powerful symbol of the nation's history and political authority. Located in the heart of Moscow, this fortified complex has been the center of Russian power for centuries, housing the offices of the President of Russia and serving as a UNESCO World Heritage Site.
The Kremlin's history dates back to the 12th century when it was established as a wooden fort. Over the years, it evolved into a grand stone fortress, with its walls and towers constructed from red brick in the late 15th century under the direction of Italian architects. The Kremlin's imposing walls stretch for over two kilometers and are punctuated by 20 towers, each with its own unique design and historical significance. The most famous of these is the Spasskaya Tower, adorned with a clock that chimes on the hour and serves as a symbol of Moscow itself.
Within the Kremlin's walls lies a treasure trove of architectural marvels and historical sites. The Cathedral Square is at its heart, surrounded by three magnificent cathedrals: the Assumption Cathedral, where Russian tsars were crowned; the Archangel Cathedral, which houses the tombs of

many Russian princes; and the Annunciation Cathedral, known for its stunning frescoes. These cathedrals showcase exquisite examples of Russian Orthodox architecture and art.

Another significant structure within the Kremlin is the Grand Kremlin Palace, which was built in the 19th century as a residence for Russian tsars. Today, it serves as an official residence for the President and hosts important state ceremonies. The palace features opulent interiors adorned with lavish decorations that reflect Russia's imperial past.

The State Armory Museum (Оружейная Палата) is another highlight within the Kremlin complex. It houses an impressive collection of royal artifacts, including crowns, thrones, ceremonial weapons, and carriages used by Russian monarchs. Visitors can explore exhibits that showcase Russia's rich cultural heritage and craftsmanship.

The Kremlin is not only a historical site but also an active political center. It has witnessed significant events throughout Russian history, from grand coronations to pivotal political decisions. Today, it remains a symbol of national pride and authority.

Surrounding the Kremlin are beautiful gardens and parks that offer stunning views of this historic site. The Alexander Garden features well-maintained pathways, fountains, and monuments commemorating key figures in Russian history. Visitors can stroll through these green spaces while enjoying picturesque views of the Kremlin's towers.

Access to the Kremlin is available to tourists who wish to explore its rich history firsthand. Guided tours provide insights into its architectural wonders and historical significance while allowing visitors to appreciate its beauty up close.

19. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

The Tower of London, one of the most famous landmarks in England, has a rich and complex history that spans over 1,000 years. Founded by William the Conqueror in 1066 as part of the Norman Conquest, the Tower was originally built to assert his power over the newly acquired territory. The White Tower, its central structure, is an impressive example of Norman military architecture and served as a royal palace and fortress.

Throughout its history, the Tower has played various roles: it has been a royal residence, a treasury, an armory, and even a menagerie. Its strategic location on the banks of the River Thames made it an essential defensive stronghold for London. The Tower's walls have witnessed numerous significant events, including royal ceremonies and political intrigue.

One of the most notorious aspects of the Tower's history is its use as a prison. Over the centuries, it has housed many high-profile prisoners, including Anne Boleyn, Thomas More, and Lady Jane Grey. The executions that took place within its walls have contributed to its dark reputation. Anne Boleyn was famously executed on Tower Green in 1536; her ghost is said to haunt the grounds to this day.

The Tudor period marked a significant transformation for the Tower. Under King Henry VIII, it became a symbol of royal power and authority. The infamous Beefeaters (Yeoman Warders) were established during this time to guard the Tower and its prisoners. Today, they serve as tour guides and custodians of its rich history.

In addition to its role as a prison, the Tower has also been a place of great ceremony. It is home to the Crown Jewels of England, which include some of the most magnificent regalia in the world. These treasures are displayed in a secure exhibition within the Tower and attract millions of visitors each year.

The 17th century saw further changes as the Tower's military significance diminished. It became more associated with ceremonial functions than with defense. However, it remained an important symbol of monarchy and national identity.

In 1840, Queen Victoria designated the Tower as a historical monument rather than an active fortress or prison. This shift marked the beginning of its transformation into a major tourist attraction. Restoration efforts were undertaken to preserve its structures and artifacts for future generations.

Today, the Tower of London is recognized as a UNESCO World Heritage Site and remains one of London's most visited attractions. Visitors come from around the globe to explore its storied past through guided tours that reveal tales of intrigue, betrayal, and royal grandeur.

The annual Ceremony of the Keys continues to be performed each night at precisely 9:53 PM—a tradition that dates back centuries—symbolizing that all gates are locked for security.

20. Выполните полный письменный перевод со словарем текста с английского языка на русский (1000-1200 п.зн. за 45 мин.)

The British Museum: A Chronicle of Human History

The British Museum, located in the heart of London, is one of the world's most renowned cultural institutions, dedicated to human history, art, and culture. Established in 1753, it was founded on the collections of Sir Hans Sloane, a physician and naturalist who bequeathed his vast array of artifacts to the nation. The museum opened its doors to the public in 1759, making it one of the first public museums in the world.

From its inception, the British Museum aimed to make knowledge accessible to all. Its founding principle was to collect and preserve objects that represented the diversity of human experience. The museum's original collection included around 71,000 items, ranging from antiquities to natural specimens. Over time, this collection has expanded exponentially and now encompasses over eight million objects.

The museum's architecture is as impressive as its collections. The original building was designed by Sir Robert Smirke in a neoclassical style and features the iconic Great Court (Большой Двор), which was completed in 2000. The Great Court houses the stunning glass-roofed Reading Room and serves as a central hub for visitors.

One of the most significant aspects of the British Museum is its vast collection of artifacts from ancient civilizations. Among its most famous exhibits are the Rosetta Stone, which played a crucial role in deciphering Egyptian hieroglyphs; the Elgin Marbles from the Parthenon in Athens; and an extensive collection of Egyptian mummies. These items not only showcase artistic achievement but also provide invaluable insights into ancient cultures.

Throughout its history, the museum has been at the center of debates regarding cultural heritage and repatriation. Many artifacts were acquired during periods of colonial expansion, leading to ongoing discussions about their rightful ownership. The museum has faced criticism for holding items that some argue should be returned to their countries of origin. In response, it has engaged in dialogue with various nations regarding cultural restitution while emphasizing its role in preserving global heritage.

The British Museum has also played a significant role in education and research. It offers numerous programs for schools and communities, aiming to foster understanding and appreciation for world cultures. Scholars from around the globe utilize its extensive library and archives for research purposes.

In addition to its permanent collections, the museum hosts temporary exhibitions that explore specific themes or cultures in greater depth. These exhibitions often draw on loans from other institutions or private collections, further enriching visitors' experiences.

Today, the British Museum attracts millions of visitors each year from all corners of the globe. It remains free to enter (though some special exhibitions may charge), reflecting its commitment to accessibility and public engagement with history and culture.

21. Просмотрите текст и ответьте на вопрос: Why do we call Russia the largest county in the world?

Located in the north, west and east latitudes of the Northern Hemisphere, most of Russia is much closer to the North Pole than to the equator. Individual country comparisons are of little value in gauging Russia's enormous size and diversity. The country's 17.1 million square kilometers include one-eighth of the Earth's inhabited land area. Its European portion, which occupies a substantial part of continental Europe, is home to most of Russia's industrial and agricultural activity and is where, roughly between the Dnieper River and the Ural Mountains, the Russian Empire took shape. Russia includes the entire northern portion of Asia.

From west to east, the country stretches from Kaliningrad to Ratmanov Island in the Bering Strait. This distance is roughly equivalent to the distance from Glasgow, Scotland, to Nome, Alaska. From north to south, the country ranges from the northern tip of the Russian Arctic islands at Franz Josef Land to the southern tip of the Republic of Dagestan on the Caspian Sea, spanning about 4,500 kilometres of extremely varied, often inhospitable terrain.

Extending for 57,792 kilometres, the Russian border is the world's longest.

22. Просмотрите текст и ответьте на вопрос: Why are there no skyscrapers in Washington, D.C?

One can hardly find a park, a square or an open area in Washington without a monument or a memorial. The most impressive and the best-known ones are the Lincoln Memorial and the Washington Monument. There are some important museums in Washington where you can see all kinds of things: famous paintings and sculptures, the dresses of President's wives, the original of the Declaration of Independence, the largest blue diamond in the world, etc. There are 5 universities in Washington.

There are no skyscrapers in Washington, because they would hide the city's many monuments from view. No building in the city may be more than 40 meters tall. Thousands of tourists visit Washington every day. People from all parts of the United States come to see then- capital.

The Jefferson Memorial was built in memory of the third President of the USA, Thomas Jefferson, who was also the author of the Declaration of Independence. The memorial is surrounded by cherry-trees. The Lincoln Memorial devoted to the memory of the 16th President of the US, the author of the Emancipation Proclamation, which gave freedom to Negro slaves in America.

23. Просмотрите текст и ответьте на вопрос: What factors contribute to the air pollution problem?

Air pollution and climate change.

Problem: Overloading of the atmosphere and of ocean waters with carbon. Atmospheric CO2 absorbs and re-emits infrared-wavelength radiation, leading to warmer air, soils, and ocean surface waters - which is good: The planet would be frozen solid without this.

Unfortunately, there's now too much carbon in the air. Burning of fossil fuels, deforestation for agriculture, and industrial activities have pushed up atmospheric CO2 concentrations from 280 parts per million (ppm) 200 years ago, to about 400 ppm today. That's an unprecedented rise, in both size and speed. The result: climate disruption.

Carbon overloading is only one form of air pollution caused by burning coal, oil, gas and wood. The World Health Organization recently estimated that one in nine deaths in 2012 were attributable to diseases caused by carcinogens and other poisons in polluted air.

Solutions: Replace fossil fuels with renewable energy. Reforestation. Reduce emissions from agriculture. Change industrial processes.

The good news is that clean energy is abundant - it just needs to be harvested. Many say a 100 percent renewable-energy future is feasible with existing technology now.

But the bad news is that even though renewable energy infrastructure - solar panels, wind turbines, energy storage and distribution systems - are already widespread, and getting cheaper and more efficient all the time, experts say we're not applying them quickly enough to prevent catastrophic climate disruption. Barriers in policy and finance remain to be overcome.

24. Просмотрите текст и ответьте на вопрос: What factors contribute to the pollution problem?

WE MUST PROTECT OUR ENVIRONMENT

Our country. Our environment. There are many big and small rivers, green forests, high mountains, lakes and seas in Russia. Our Earth is our home. I think people must take care of our Motherland. But the problem of pollution now is very important. There are some factors that increase the problem.

First of all, our plants and factories put their waste materials into water and atmosphere and pollute the environment. There are many kinds of transport in our cities. We can't ignore their effect on the environment, that is why we must pay attention to the protection of our nature and the health of the people.

Radiation. Now it has become one of the main problems. It is not good for health of people. Many people died from radiation some years ago in Chernobol. It was a tragedy. The other problem is an earthquake. We know some terrible earthquakes in Chile, Haiti, Japan. Our scientists try to forecast earthquakes, then we can protect ourselves from them.

25. Просмотрите текст и ответьте на вопрос: What are key features of the green economy?

KEY FEATURES OF THE GREEN ECONOMY

Simply put, a green economy is low-carbon, resource efficient, and socially inclusive. Some of it's key features include:
Abundant opportunities for good green jobs that pay a living wage.
A price on carbon, either through a cap-and-trade program or an economy-wide tax on carbon.
More efficient use of energy and other resources. For example, huge economic and environmental gains could be made if we had more energy efficient buildings and transportation.
Greater use of renewable resources, like wind and solar, instead of non-renewable resources, such as coal and oil.
Greener manufacturing which is resource efficient and doesn't use toxic chemicals
Proper value assigned to natural environments and ecosystems, in recognition of all the services the environment provides such as carbon sequestration, flood protection, and waste water treatment.
A robust recycling and reuse industry, with minimal waste sent to landfill.

26. Просмотрите текст и ответьте на вопрос: Why is it important to plant and restore forests?

Deforestation.
Problem: Species-rich wild forests are being destroyed, especially in the tropics, often to make way for cattle ranching, soybean or palm oil plantations, or other agricultural monocultures.
Today, about 30 percent of the planet's land area is covered by forests - which is about half as much as before agriculture got started around 11,000 years ago. About 7.3 million hectares (18 million acres) of forest are destroyed each year, mostly in the tropics. Tropical forests used to cover about 15 percent of the planet's land area; they're now down to 6 or 7 percent. Much of this remainder has been degraded by logging or burning.
Not only do natural forests act as biodiversity reserves, they are also carbon sinks, keeping carbon out of the atmosphere and oceans.
Solutions: Conserve of what's left of natural forests, and restore degraded areas by replanting with native tree species. This requires strong governance - but many tropical countries are still developing, with increasing populations, uneven rule-of-law, and widespread cronyism and bribery when it comes to allocating land use.

27. Просмотрите текст и ответьте на вопрос: What is green economy?

WHAT IS THE GREEN ECONOMY?
Today, many people realize that it's not about the environment versus the economy, not a tradeoff between unemployment and pollution. It's not about picking one or the other.
We cannot choose between the environment and the economy. We need both.
This realization is at the heart of an emerging economic and environmental concept, often termed " the green economy."
It reflects a growing recognition that, on the one hand, the challenge of sustainability rests almost entirely in getting the economy right. Putting a price on carbon, valuing natural capital and ending perverse subsidies, among other things, are all vital to meaningful environmental reform.
And, on the other hand, if we wish to create a sustainable economy, we must pay more attention to the environment. Against a backdrop of climate change, resource scarcity, the massive loss of biodiversity and a variety of other environmental issues, business as usual is increasingly risky.
The green economy was initially driven by an environmental imperative, the recognition that climate change and ecological degradation threaten our future prosperity. But today, it is driven equally by opportunity, the recognition that a green economy opens up new possibilities for jobs and growth. As a recent report from the U.N. put it, "the greening of economies is not generally a drag on growth but rather a new engine of growth…a net generator of decent jobs…"

28. Просмотрите текст и ответьте на вопрос: "What are the pivotal moments in the history of medieval London?

London, the capital city of England and the United Kingdom, boasts a rich and diverse history that spans over two millennia. Its origins can be traced back to the Roman period when it was established as Londinium around AD 43. The Romans recognized the strategic importance of the River Thames for trade and transportation, leading to the rapid growth of the settlement. By the end of the first century, Londinium had developed into a bustling town with a population of around 60,000,

complete with a forum, basilica, and defensive walls.
Following the decline of Roman rule in the early 5th century, London experienced a period of instability and fragmentation. The Anglo-Saxons began to settle in the area, and by the 9th century, it had become an important trading hub known as Lundenwic. However, this prosperity was threatened by Viking invasions, leading to the establishment of fortified settlements.
The Norman Conquest in 1066 marked a significant turning point in London's history. William the Conqueror built the Tower of London as a symbol of power and control over the city. The subsequent centuries saw London grow in importance as a political and economic center. The establishment of institutions such as Parliament and the Church further solidified its status.
The medieval period was marked by significant events such as the Black Death in 1348, which decimated London's population but also led to social and economic changes. The city continued to expand during the Tudor period, becoming a cultural hub under monarchs like Henry VIII and Elizabeth I.
The Great Fire of London in 1666 was another pivotal moment that reshaped the city. It destroyed much of medieval London but also provided an opportunity for reconstruction. Sir Christopher Wren played a crucial role in redesigning St. Paul's Cathedral and other buildings that defined London's skyline.
The Industrial Revolution in the 18th and 19th centuries transformed London into one of the world's largest cities. It became a center for finance, trade, and industry, attracting millions from rural areas and abroad. This rapid urbanization brought challenges such as overcrowding and pollution but also led to advancements in infrastructure, including railways and public transport.
The 20th century saw London endure two World Wars, which caused significant destruction but also fostered resilience among its inhabitants. Post-war reconstruction efforts led to modernization while preserving historical landmarks.
Today, London is a vibrant global city known for its cultural diversity, economic significance, and historical heritage. From its Roman roots to its status as a modern metropolis, London's history is a testament to its ability to adapt and thrive through centuries of change.

29. Просмотрите текст и ответьте на вопрос: What time does London’s origin trace back?

London's origins trace back to a strategic decision by Roman invaders in 43 AD, when Emperor Claudius established Londinium as a key military and trading settlement. This foundational period shaped the city's enduring character through several critical developments:
Roman Establishment (43-60 AD)
- Founded as a river port at the narrowest Thames crossing point
- Initial settlement covered 1.4 km² (modern City of London area)
- Strategic location connected roads to major Roman British towns

Boudican Revolt & Rebuilding (60-120 AD)
- Destroyed in 60 AD by Iceni tribe led by Queen Boudica (королева Боадицея), a queen of the ancient British Iceni tribe (племя иценов), who led a failed uprising against the conquering forces of the Roman Empire in AD 60 or 61.
- Reconstructed with improved stone defenses and grid-pattern streets
- Built first London Bridge (wooden, near modern bridge location)

Peak Roman Development (2nd-4th Century)
- Became provincial capital of Britannia by 100 AD
- Constructed major infrastructure:
  - Basilica (largest north of Alps)
  - Amphitheater (discovered under Guildhall)
  - 3 km defensive wall (sections still visible)
- Reached population of 30,000-45,000

Key Foundations for Future Growth
- Established as England's first international trade hub
- Created enduring street patterns still visible today
- Built original Thames embankments
- Developed as administrative center (traits continuing today)

Decline and Transition (5th Century)

- Roman withdrawal around 410 AD led to urban decline
- Settlement continued at reduced scale (Saxon Lundenwic)
- Original walls maintained through Middle Ages

The Roman foundation established London's lasting advantages: strategic location, commercial orientation, and administrative importance - qualities that would eventually propel it to global prominence.

30. Просмотрите текст и ответьте на вопрос: “What are the key economic changes London has undergone in the 21st Century (2000–Present) “

London’s Transformation in the 21st Century (2000–Present)

Since 2000, London has undergone dramatic changes, solidifying its status as a global city while facing new challenges. From urban regeneration to economic shifts, the capital has evolved in response to globalization, technological advances, and socio-political changes.

1. Urban Regeneration & Architecture

- The Shard (Шард – название небоскреба ввиде «осколка» (2012): Europe’s tallest skyscraper (310m), symbolizing modern London.
- Olympic Legacy (2012): Stratford’s transformation with Queen Elizabeth Olympic Park and new neighborhoods.
- Crossrail (Elizabeth Line, 2022): Europe’s largest infrastructure project, improving east-west transit.

2. Economic Shifts

- Tech Boom: Rise of "Silicon Roundabout" (Old Street) as a rival to California’s tech hubs.
- Brexit Impact: Financial sector adjustments, though London remains Europe’s top financial center.
- Green Economy: Growth in renewable energy startups and low-emission policies (ULEZ expansion).

3. Cultural & Demographic Changes

- Population Growth: From 7.2 million (2000) to nearly 9 million today.
- Super-Diversity: Over 300 languages spoken; 45% of residents foreign-born.
- Cultural Landmarks: Tate Modern extension (2016), V&A East (2025).

4. Challenges

- Housing Crisis: Soaring prices push residents farther out; "Generation Rent" struggles.
- Climate Resilience: Flood risks (Thames Barrier upgrades) and urban heat island effect.
- Social Inequality: Wealth gaps widen despite economic growth.

The Future of London

31. Просмотрите текст и ответьте на вопрос: “ Why are smart homes and low-power devices considered to be key solutions for sustainable living? “

Smart Homes and Low-Power Devices: Green Technology for Sustainable Living

As energy demands rise and environmental concerns grow, smart homes and low-power devices are emerging as key solutions for sustainable living. By integrating energy-efficient technologies with automation, modern households can significantly reduce electricity consumption, minimize waste, and lower carbon footprints.

Smart homes use IoT (Internet of Things) devices to optimize energy usage by:

- Automated lighting systems (e.g., motion sensors, smart bulbs like Philips Hue) that turn off when not needed.
- Smart thermostats (e.g., Nest, Ecobee) that learn user habits and adjust heating/cooling to save energy.
- Energy monitoring systems that track real-time electricity usage and suggest optimizations.

Low-Power Devices: Reducing Energy Waste

Advances in semiconductor technology have led to ultra-efficient electronics:

- Low-power processors (e.g., ARM Cortex-M for IoT) that extend battery life in smart sensors.
- Energy Star-certified appliances (refrigerators, washing machines) that consume 10–50% less power.
- Solar-powered smart gadgets (e.g., smart blinds, outdoor cameras) that rely on renewable energy.

Green Technology in Smart Homes

1. Energy Storage & Renewable Integration
o Home battery systems (e.g., Tesla Powerwall) store solar energy for nighttime use.
o Smart inverters optimize solar panel output, feeding excess power back to the grid.
2. AI-Driven Energy Management
o AI algorithms predict usage patterns and shift high-power tasks (e.g., EV charging) to off-peak hours.
3. E-Waste Reduction
o Modular smart devices (e.g., Framework Laptop) allow easy upgrades, reducing electronic waste.
o Companies like Apple use recycled materials in products like HomePod.

Smart homes and low-power devices exemplify how green technology can merge sustainability with convenience. By adopting these solutions, households can cut energy bills, reduce reliance on fossil fuels, and contribute to a zero-waste future.

32. Просмотрите текст и ответьте на вопрос: “ How does the Gulf Stream work”

The Gulf Stream's Vital Role in Europe's Climate

The Gulf Stream is a powerful Atlantic Ocean current that transports warm water from the Gulf of Mexico to Northwestern Europe. This "heat conveyor belt" is responsible for Europe's unusually mild climate given its high latitudes, making winters in London warmer than those in Newfoundland at the same latitude.

How the Gulf Stream Works

1. Current Mechanics:
o Begins in the Gulf of Mexico (water heated to 30°C)
o Flows northeast at 2-5 mph (100x Amazon River volume)
o Cools near Greenland, sinks, and returns south (AMOC circulation)
2. Heat Transfer:
o Releases heat equivalent to 1.5 million nuclear power plants
o Raises European temperatures by 5-10°C in winter

Europe's Climate Dependence

Temperature Regulation:

- UK/Ireland: 10°C warmer than same-latitude Canada
- Norway: Coastal ports remain ice-free year-round
- France: Enables wine-growing at 48°N (parallel to Canada's cold Newfoundland)

Precipitation Patterns:

- Brings moisture for Western Europe's rainfall
- Supports agriculture from Ireland to Ukraine

Climate Change Threats

1. AMOC Weakening:
o 15% slowdown since 1950 (IPCC data)
o Melting Greenland ice dilutes salty water, disrupting sinking mechanism
2. Potential Collapse:
o Could lower European temperatures by 3-5°C
o May increase storms and shift rain belts southward

Economic and Ecological Impacts

1. Agriculture:
o UK growing seasons could shorten by 30 days
o Mediterranean drought intensification
2. Energy:
o Increased winter heating demands
o Reduced hydropower in Scandinavia
3. Ecosystems:
o North Sea fisheries disruption
o Boreal forest migration

Monitoring and Solutions

33. Просмотрите текст и ответьте на вопрос: “What is the history of the Union Jack“

The flag of the UK is known as the Union Jack. It has its history. It all began in 1603 when Scotland

was joined to England and Wales. The flag is made up of 3 crosses. The upright cross is the Cross of St. Jeorge the patron saint of England. The white diagonal cross is the cross of St. Andrew, the patron saint of Scotland. The red diagonal cross is the cross is the cross of St. Patrick, the patron saint of Ireland. All of them are on the blue background. The national anthem is . The national currency is pound. Geographically the island of Great Britain is subdivided into 2 main regions: Lowland Britain and Highland Britain. Lowland Britain comprises southern and eastern England. Highland Britain consists of Scotland, most of Wales, the Pennines (or the Pennine Chain) and the Lake District. The highest mountain top is Ben Nevis in Scotland. The chief rivers of Great Britain are: the Severn, separating England and Wales, the Thames (the longest and the deepest one). The swiftest flowing river is the Spray. Also the Tweed is famous (the woolen fabric is made here). Every country in the UK has its own national emblem. The red rose is the national emblem of England, the thistle is the national emblem of Scotland, the daffodils and the leek are the emblems of Wales, and the shamrock (a kind of clover) is the emblem of Ireland.

34. Просмотрите текст и ответьте на вопрос: “ What are the functions of the monarch in the United Kingdom? “

The United Kingdom is a constitutional monarchy. It has a monarch - a King or a Queen. The present British monarch is Queen Elizabeth the Second. She become Queen in 1952. The monarch has little power and can reign with the support of Parliament. British Parliament is the legislative body at the country. It consists of two Houses. The House of Commons and House of Lords. Parliament and the monarch have different roles in the Government of the country. In reality, the House of Commons has truth power. It introduces new bills. Then they go to the House of Lords for approval. The functions of the Queen are: to open the sessions of the Parliament, to head the commonwealth, to be Commander-in-Chief, to declare the war, to make peace. The house of commons is made up of 650 elected knows of members of parliament. The party which has the majority of suits in the Government and its leader usually becomes prime minister. The prime minister forms his or her Cabinet Ministers. The chairman of the House of Commons is the Speaker. The chairman of the House of Lords is the Lord Chancellor. He sits on a special place, which is called the woolsack. It means that wool made England rich. The members of the House of Lords are not elected, there are live peers. There are several political parties in Great Britain. They are the Conservative, the Liberal, the Labor, the Social Democratic and the Communist parties. Prime minister of the country Boris Johnson is leader of the Conservative Party.

35. Просмотрите текст и ответьте на вопрос: “ What natural resources is the Siberian region rich in?”

Siberia, in the north of Russia, is one of the coldest, harshest places on earth. Famed for its inhospitable climate, it is also mineral-wealthy and unexploited – a true frontier region. Although it has attracted mining companies for decades, the challenging landscape and conditions have meant they have only just begun to scratch the surface of the area’s potential.

This could now be changing; as climate change leads to warmer temperatures, ice and permafrost are melting and potentially easing the mining process. The mining sector is the second biggest contributor to GDP in Russia, and is expected to continue to play an important role in its economy.

Mining in Siberia grew exponentially during the 20th century, as successive governments and leaders sought to take advantage of it. “The Siberian region is rich in minerals including coal, gold, diamond and iron ore,” says Globaldata analyst Alok Shukla. “Coal is largely extracted from Kemerovo, Krasnoyarsk Krai, Sakha (Yakutia), Republic of Khakassia, and Irkutsk Oblast. Gold originates mainly from Krasnoyarsk Krai and Irkutsk Oblast.”

Russia is responsible for 7% of global aluminium production, and 95% of this takes place in Siberia. It is home to Russia’s largest coal mine, the Arshanovsky pit in the Khakassia Republic which opened in 2015. When at full capacity it is expected to produce 10 million tonnes of coal, and there are already plans to expand it further. Siberia and the Far East also hold 84% of Russia’s known gold reserves.

But much remains unexplored or inaccessible in Siberia still, leaving the true mineral wealth of the region uncertain. In 2016, a mineral was discovered in Siberia unlike any ever found naturally occurring on earth. Instead it appears to be similar to lab-grown metal-organic frameworks. Such

discoveries highlight the potential of a region so long hidden under ice and thick forests.

36. Просмотрите текст и ответьте на вопрос: “What are the consequences of global warming”

In recent years, climate change has been a much talked about issue, with many debates over its possible impact on the world, and some even going so far as to question its very existence. However, with the undeniable increase in greenhouse emissions on Earth, there can be no doubt that the earth is becoming warmer.

So what exactly does this mean for the future of our planet? In chilly places like the UK, we may think to ourselves: ‘Finally, warmer weather!’ But global warming will in fact cause extreme weather conditions, meaning that our winters would be even colder than they are now. More than that, warmer temperatures will lead to the melting of ice in the north and south poles, which in turn will lead to rising sea levels across the globe. This is particularly troubling for low coastal regions such as Florida in the USA which would be among the first to be flooded, along with many islands around the world, including the United Kingdom. In 1000 years or so, all these places and more will be submerged underwater.

So where will be able to live? Unless we can find a way to evolve into mermaids and mermen, which doesn’t look promising, the only solution is to move elsewhere. There will be little choice left once a large proportion of the land is lost to the sea, and other remaining places will be so hot that they will be absolutely impossible to survive in. It is possible, then, that the once frozen poles of the Arctic and Antarctica will be suitable enough to live in, having melted its ice and warmed up.

It’s a scary thought to imagine such devastation on Earth. Perhaps if people start to realize how their actions now can have such a profound impact on future generations, they will change their attitude and start to think more about caring for the environment, in order to save it.

37. Просмотрите текст и ответьте на вопрос: “What is the weather like in Wales in autumn and winter?“

Inland Weather in Wales

The higher you get in Wales, the colder and wetter it gets. And as you move away from the coasts, Wales is quilted with river valleys separated by increasingly higher hills. The Brecon Beacons in south Wales, are softly rolling but enormous, windswept hills where winter temperatures below freezing and snowfalls are not uncommon. Further north, in the inland mountains of Snowdonia National Park, heavy precipitation can be extreme. One mountain peak, Crib Goch, may be the wettest place in the entire country with an astonishing 176 inches of rainfall annually.2 And on the highest peaks, it snows a great deal.

Mount Snowdon, at 3,560 feet and the highest U.K. mountain south of Scotland, can experience snowfall from October to May.

Snowfall at lower altitudes is rare, with an average of only 10 days a year with snow lying on the ground in the south and west Wales. On the other hand, the mountains of Snowdonia average 30 days a year with snowfall lying on the ground.

Autumn and Winter in Wales

In September, temperatures linger in the 60s but fall away rapidly through October and November into the high 40s. January and February are the coldest months with temperatures hovering around freezing or slightly above in higher areas and in the high 40s along the coast. Temperatures at night are usually 10 to as much as 15 degrees Fahrenheit colder depending on where you are in the country.

October through January are the wettest months. Rain tends to fall in short, sharp and very heavy showers. November is particularly squally with rain accompanied by gusty winds.

38. Просмотрите текст и ответьте на вопрос: “Why is Scotland is the land of myths and mysteries? “

Scotland is a country in the north of Great Britain. It is a part of the United Kingdom. Scotland is divided into three natural regions: the Southern Uplands, the Central Lowlands and the Highlands and islands. A lot of places in Scotland are a natural paradise, still untouched by man.

The capital of Scotland is Edinburgh, well known for its castle. Glasgow is the industrial capital of Scotland. It is the third largest city in Great Britain. The typical products of Scotland are timber,

whisky, salmon. Golf is the Scottish natural sport and it seems to have originated in this country. Scotland is also the land of myths and mysteries; every castle has its ghost. Glamis Castle is said to have nine of them. And of course everyone knows about the Loch Ness Monster. 'Nessie" is said to be about six meters long, with a long, thin neck. The first report of the monster in Loch Ness was in 565 A.D. Since 1934, thousands of people claimed to they had seen the monster. Scientists have investigated the Loch and taken pictures but no scientific explanation of the mystery has been given. Scotland is the north part of Great Britain. Five million people live in Scotland. Edinburgh is the capital of Scotland.

39. Просмотрите текст и ответьте на вопрос: “What is the London Eye?“

The London Eye, or the Millennium Wheel, is a cantilevered observation wheel on the South Bank of the River Thames in London. It is Europe's tallest cantilevered observation wheel, and is the most popular paid tourist attraction in the United Kingdom with over 3 million visitors annually. It has made many appearances in popular culture.

The structure is 135 metres (443 ft) tall and the wheel has a diameter of 120 metres (394 ft). When it opened to the public in 2000 it was the world's tallest Ferris wheel. Its height was surpassed by the 167 metres (548 ft) High Roller (Las Vegas) in 2014. Supported by an A-frame on one side only, unlike the taller Nanchang and Singapore wheels, the Eye is described by its operators as "the world's tallest cantilevered observation wheel".

The London Eye used to offer the highest public viewing point in London until it was superseded by the 245-metre-high (804 ft) observation deck on the 72nd floor of The Shard, which opened to the public on 1 February 2013.

In March 2020, the London Eye celebrated its 20th birthday by turning several of its pods into experiences themed around London, in partnership with its sponsor lastminute.com. The special experiences included a pub in a capsule, a west end theatre pod and a garden party with flower arrangements to represent the eight London Royal parks.

40. Просмотрите текст и ответьте на вопрос: "The Global Waste Crisis"

The Global Waste Crisis

Every year, the world generates over 2 billion tons of municipal solid waste, with plastic, electronic waste (e-waste), and food waste being major contributors. Landfills and incineration—traditional waste disposal methods—release harmful greenhouse gases (like methane and CO_2) and toxic chemicals, accelerating climate change and pollution.

Green Technology Solutions for Waste Management

1. Smart Recycling Systems
   - AI-powered waste sorting robots (e.g., ZenRobotics) use machine learning to separate recyclables with high precision.
   - Blockchain-based tracking ensures transparent recycling processes, reducing illegal dumping.
2. Waste-to-Energy (WtE) Technologies
   - Biogas plants convert organic waste into renewable energy.
   - Plasma gasification breaks down non-recyclable waste into clean syngas for electricity.
3. Circular Economy & Sustainable Materials
   - Companies like TerraCycle upcycle hard-to-recycle waste into new products.
   - Biodegradable packaging (e.g., Mushroom-based materials, seaweed plastics) replaces single-use plastics.
4. E-Waste Innovations
   - Urban mining extracts precious metals (gold, lithium) from discarded electronics.
   - Modular smartphones (e.g., Fairphone) reduce e-waste by enabling easy repairs.
5. Zero-Waste Initiatives
   - Cities like San Francisco aim for zero waste through strict recycling/composting laws.
   - Edible cutlery and reusable container programs cut down disposable waste.

41. Ответьте на вопрос:

What places of interest are there in London?

42. Ответьте на вопрос:
What can you say about the system of higher education in Russia?
43. Ответьте на вопрос:
Does Russia have a borderline with the USA?
44. Ответьте на вопрос:
What is the longest river in the European part of Russia? What can you say about it?
45. Ответьте на вопрос:
What do you know about climate in England?
46. Ответьте на вопрос:
In what wat have computers changed our life?
47. Ответьте на вопрос:
What do you know about theaters in Moscow?
48. Ответьте на вопрос:
“How do you feel about artificial intelligence like Siri and Alexa?”
49. Ответьте на вопрос:
“How have technological advances affected communication ?”
50. Ответьте на вопрос:
“How have technological advances affected education?”
51. Ответьте на вопрос:
“ What do you think is the biggest advantage of modern technology?”
52. Ответьте на вопрос:
“Is there a tech product you want these days? What is it? How will it make your life better?”
53. Ответьте на вопрос:
“ How has technology impacted our work, studies and career?”
54. Ответьте на вопрос:
“What do you think is the most important breakthrough in history ?”
55. Ответьте на вопрос:
“What industrial applications of electricity do you know ?”
56. Ответьте на вопрос:
“What makes it possible to eliminate air and water pollution?”
57. Ответьте на вопрос:
“What actions are necessary to take to deal successfully with the problem of protecting the environment throughout the world ?”
58. Ответьте на вопрос:
“What interesting facts do you know about the University of Cambridge?”
59. Ответьте на вопрос:
“What sights are there in London ?”
60. Ответьте на вопрос:
“What are you favorite places of interest in Moscow ?”

3 семестр, Экзамен
Контролируемые ИДК: УК-4.1 УК-4.2 УК-4.3 УК-4.4
Вопросы/Задания:
1. Translate the text. (1800 printed characters; time – 45 min.)

GEODETIC AND PLANE SURVEYS

Two general classifications of surveys are geodetic and plane. They differ principally in the assumptions on which the computations are based, although field measurements for geodetic surveys are usually performed to a higher order of accuracy than those for plane surveys.

In geodetic surveying, the curved surface of the Earth is considered by performing the computations

on an ellipsoid (curved surface approximating the size and shape of the Earth). It is now becoming common to do geodetic computations in a three-dimensional, Earth-centered, Earth-fixed (ECEF) Cartesian coordinate system. The calculations involve solving equations derived from solid geometry and calculus. Geodetic methods are employed to determine relative positions of widely spaced monuments and to compute lengths and directions of the long lines between them. These monuments serve as the basis for referencing other subordinate surveys of lesser extents.

In early geodetic surveys, painstaking efforts were employed to accurately observe angles and distances. The angles were measured using precise ground-based theodolites, and the distances were measured using special tapes made from metal having a low coefficient of thermal expansion. From these basic measurements, the relative positions of the monuments were computed. Later, electronic instruments were used for observing the angles and distances. // Although these latter types of instruments are still sometimes used on geodetic surveys, satellite positioning has now almost completely replaced other instruments for these types of surveys. Satellite positioning can provide the needed positions with much greater accuracy, speed, and economy. GNSS receivers enable ground stations to be located precisely by observing distances to satellites operating in known positions along their orbits.

2. Translate the text. (1800 printed characters; time – 45 min.)

Satellite positioning can provide the needed positions with much greater accuracy, speed, and economy. GNSS receivers enable ground stations to be located precisely by observing distances to satellites operating in known positions along their orbits. GNSS surveys are being used in all forms of surveying including geodetic, hydrographic, construction, and boundary surveying. The principles of operation of the global positioning system are given further, field and office procedures used in static GNSS surveys are discussed still further, and the methods used in kinematic GNSS surveys are discussed even further.

In plane surveying, except for leveling, the reference base for fieldwork and computations is assumed to be a flat horizontal surface. The direction of a plumb line (and thus gravity) is considered parallel throughout the survey region, and all observed angles are presumed to be plane angles. For areas of limited size, the surface of our vast ellipsoid is actually nearly flat. On a line 5 mi long, the ellipsoid arc and chord lengths differ by only about 0.02 ft. A plane surface tangent to the ellipsoid departs only about 0.7 ft at 1 mi from the point of tangency. In a triangle having an area of 75 square miles, the difference between the sum of the three ellipsoidal angles and three plane angles is only about 1 sec. Therefore, it is evident that except in surveys covering extensive areas, the Earth's surface can be approximated as a plane, thus simplifying computations and techniques. // In general, algebra, plane and analytical geometry, and plane trigonometry are used in plane-surveying calculations. Even for very large areas, map projections allow plane-surveying computations to be used.

3. Translate the text. (1800 printed characters; time – 45 min.)

Survey work of all kinds tends to be expensive and the precise comparative cost of air and ground methods can usually only be determined with regard to particular cases. Air survey methods benefit from economies of scale where a large number of boundaries or points of detail have to be recorded. The capital and running costs of aeroplanes and the equipment used in aerial surveys are high, and the personnel required are highly skilled and relatively well paid in comparison with some field surveyors. The number of days in the year on which flying can be done is normally quite small but then in many countries the number of days on which field survey work can be carried out is restricted

for climatic reasons though not so much as for flying.
There may be difficulty in getting approval for air survey from the military authorities who in many countries have traditionally opposed public access to aerial photographs for supposed security reasons. Given the ready availability and quality of modern satellite imagery, this restriction makes little sense. Would-be terrorists can easily obtain from elsewhere the sort of information that opponents of public access to aerial photography seek to hide. Opposition to the use of aerial photography has increased the cost of many surveys and reduced their effectiveness with consequent but unmeasured costs that have significant impact on the national economy.//
Broadly speaking, aerial photographs have been used in cadastral mapping in five different ways. In the simplest case, contact scale or enlarged photographs may be used as a base on which to outline the parcels. In some countries it is sufficient to produce a plan which acts as a signpost to the parcels, the boundaries of which can be determined by inspection on the ground. In such cases there is no need to record the accurate dimensions of any land parcel so long as its boundaries are clearly visible on the photographs. Thus in Kenya, photographs enlarged to 1: 2,500 scale have been used to form the base from which the boundaries of the parcels could be traced. Such an approach is expedient where large numbers of parcels need to be recorded over a short period of time. Where time and money allow, the areas can be resurveyed to higher accuracy at a later date.
More accurate mapping may be achieved by using rectified photographs that remove any distortions occurring when the photography is not done with the camera pointing exactly vertically downwards. The Land Titling Programme in Thailand made extensive use of enlarged rectified photographs, with supplementary information provided by ground survey. Cadastral photomaps at scales of 1:4,000 and larger were produced. A similar technique was used in Botswana where the photo-maps were suitably annotated to identify particular parcels. Given a vast area of savannah country with no nearby ground survey control, it is possible to identify patterns in the vegetation and to trace on to the photographs the outlines of areas of land allocated for purposes such as veterinary stations, air strips and police posts. The dimensions of the plots can then be added from measurements made by taping on the ground. A disadvantage in using rectifiers is the relatively high cost of this equipment.

4. Translate the text. (1800 printed characters; time – 45 min.)

Except for control surveys, most other types described are usually performed using plane-surveying procedures, but geodetic methods may be employed on the others if a survey covers an extensive area or requires extreme accuracy.

Ground, aerial, and satellite surveys are broad classifications sometimes used. Ground surveys utilize measurements made with ground-based equipment such as automatic levels and total station instruments. Aerial surveys are accomplished using either photogrammetry or remote sensing. Photogrammetry uses cameras that are carried usually in airplanes to obtain images, whereas remote sensing employs cameras and other types of sensors that can be transported in either aircraft or satellites. Procedures for analyzing and reducing the image data are described further. Aerial methods have been used in all the specialized types of surveys listed, except for optical tooling, and in this area terrestrial (ground-based) photographs are often used. Satellite surveys include the determination of ground locations from measurements made to satellites using GNSS receivers, or the use of satellite images for mapping and monitoring large regions of the Earth.

Computerization speeds up the processes of field and photogrammetric survey, the storage, retrieval and analysis of data, and the preparation and production of cadastral maps and plans.

5. Translate the text. (1800 printed characters; time – 45 min.)

TRIANGULATION

A system of triangles usually affords superior horizontal control. All of the angles and at least one side (the base) of the triangulation system are measured. Though several arrangements can be used, one of the best is the quadrangle or a chain of quadrangles. Each quadrangle, with its four sides and two diagonals, provides eight angles that are measured. To be geometrically consistent, the angles must satisfy three so-called angle equations and one side equation. That is to say the three angles of each triangle, which add to 180°, must be of such sizes that computation through any set of adjacent triangles with the quadrangles will give the same values for any side. Ideally, the quadrangles should be parallelograms. If the system is connected with previously determined stations, the new system must fit the established measurements.

When the survey encompasses an area large enough for the Earth's curvature to be a factor, an imaginary mathematical representation of the Earth must be employed as a reference surface. A level surface at mean sea level is considered to represent the Earth's size and shape, and this is called the geoid. Because of gravity anomalies, the geoid is irregular; however, it is very nearly the surface generated by an ellipse rotating on its minor axis – i.e. an ellipsoid slightly flattened at the ends, or oblate. Such a figure is called a spheroid. //Several have been computed by various authorities; the one usually used as a reference surface by English-speaking nations is (Alexander Ross) Clarke's Spheroid of 1866. This oblate spheroid has a polar diameter about 27 miles (43 kilometres) less than its diameter at the Equator.

Because the directions of gravity converge toward the geoid, a length of the Earth's surface measured above the geoid must be reduced to its sea-level equivalent – i.e. to that of the geoid. These lengths are assumed to be the distances, measured on the spheroid, between the extended lines of gravity down to the spheroid from the ends of the measured lengths on the actual surface of the Earth. The positions of the survey stations on the Earth's surface are given in spherical coordinates.

Bench marks, or marked points on the Earth's surface, connected by precise leveling constitute the vertical controls of surveying. The elevations of bench marks are given in terms of their heights above a selected level surface called a datum. In large-level surveys the usual datum is the geoid. The elevation taken as zero for the reference datum is the height of mean sea level determined by a series of observations at various points along the seashore taken continuously for a period of 19 years or more. Because mean sea level is not quite the same as the geoid, probably because of ocean currents, in adjusting the level grid for the United States and Canada all heights determined for mean sea level have been held at zero elevation.

6. Translate the text. (1800 printed characters; time – 45 min.)

TOOLS AND PRODUCTS OF MODERN GEODESY

Today, the toolbox of geodesy comprises a number of space-geodetic and terrestrial techniques, which together allow for detailed observations of the «three pillars of geodesy» (Geokinematics, Earth Rotation, the Gravity Field) on a wide range of spatial and temporal scales. With a mix of terrestrial, airborne, and spaceborne techniques, geodesy today determines and monitors changes in Earth's shape, gravitational field and rotation with unprecedented accuracy, resolution (temporal as well as spatial), and long-term stability. At the same time, geodetic observation technologies are in constant development with new technologies extending the observation capabilities almost continuously in terms of accuracy, spatial and temporal coverage and resolution, parameters observed, latency and quality. Together, these observations provide the basis to determine and monitor the ITRF and ICRF as the metrological basis for all Earth observations. Equally important, the observaitons themselves are directly related to mass transport and dynamics in the Earth system. Thus, the geodetic measurements form the basis for Earth system observations in the true meaning of these words. Beutler et al. suggested a development towards an interdisciplinary service in support of Earth sciences for the IGS. With the establishment of GGOS, IAG has extended this concept of an observing system and service for Earth system sciences to the whole of geodesy.//

It is obvious that there is an intimate relationship between the three pillars of geodesy and the reference systems and frames. For geokinematics and Earth rotation, the relationship works both ways: the reference systems are required for positioning purposes (terrestrial and celestial) and for studying Earth rotation, and monitoring through the space geodetic techniques is necessary to realize the two frames and the time-dependent transformation between them.

7. Translate the text. (1800 printed characters; time – 45 min.)

A Brief History of Surveying, Geodesy, and Geomatics

Surveying dates back to ancient civilizations, where early land measurement was essential for agriculture, construction, and taxation. The Egyptians (around 3000 BCE) used simple geometry to reestablish property boundaries after Nile floods, while the Greeks and Romans advanced surveying for road and aqueduct construction.

During the Renaissance, geodesy—the science of Earth's shape and size—gained prominence. Eratosthenes (240 BCE) calculated Earth's circumference, while 17th-century astronomers like Snellius and Picard improved triangulation methods. The invention of the theodolite (16th century) and later the telescope-enhanced instruments revolutionized precision.

The 18th–19th centuries saw national surveying projects, such as the Great Trigonometric Survey of India and the French meridian arc measurements, refining the geodetic model. The industrial era introduced mechanical calculators and standardized units (meter, 1791).

The 20th century brought seismic shifts: aerial photography (WWI), electronic distance measurement (1940s), and satellite geodesy. The launch of Sputnik (1957) enabled Doppler positioning, leading to GPS (1973). Computers digitized mapping, birthing geomatics—the integration of surveying, GIS, and remote sensing.

Today, GNSS, LiDAR, and AI-driven analytics dominate, enabling real-time, centimeter-accurate positioning. From ropes and chains to space-based tech, surveying remains foundational in shaping our understanding of space and place.

8. Translate the text. (1800 printed characters; time – 45 min.)

A geodetic network is a network of triangles which are measured exactly by techniques of terrestrial surveying or by satellite geodesy. In "classical geodesy" (up to the sixties) this is done by triangulation, based on measurements of angles and of some spare distances; the precise orientation to geographic North is done by methods of geodetic astronomy. The mainly used instruments are theodolites and tacheometers to be equipped by infrared range finders, data bases, communication systems and partly by satellite links. Beginning with ca 1960, the electronic distance measurement (EDM) was introduced, when the first prototypes became small enough to work in the field. EDM increased the network accuracies up to 1:1 million (1 cm per 10 km; today at least 10 times better), and also the economy of surveying. At the same time the geodetic use of satellites begun, e.g. the bright satellites of Echo I and II and Pageos. By means of these space probes, global networks were determined, which later proved the theory of plate tectonics.

An important improvement was the introduction of radio and electronic satellites like Geos A and B (1965-70), of the Transit system15 (Doppler effect) 1967-1990 — which was the predecessor of the GPS - and of laser techniques like Lageos (USA) or Starlette (France).

Despite of the space techniques, small networks for cadastre and technical projects are mainly measured terrestrially, but in many cases closed together to national and global networks by satellite geodesy. //

In the meantime, several hundred geodetic satellites are orbiting, supplemented by a huge number of remote sensing satellites - and last but not least by the navigation systems of GPS and GLONASS, which will be followed by the European Galileo satellites in 2008. Nowadays the spacebased geodetic networks17 are more flexible and economic than terrestrial ones; the further existence of fixed point18 networks is already discussed, but will survive at least for administrational and legal demands on local and regional scales. Whereas the worldwide networks cannot be defined to be fixed, because Geodynamics is chancing the position of all continents by amounts of 2 cm up to 20 cm per year. Therefore, modern global networks like ETRF or ITRF (International Terrestrial Reference Frame) show not only coordinates of their "fixed points", but also their annual velocities.

9. Translate the text. (1800 printed characters; time – 45 min.)

Geoid and reference ellipsoid

1. Geoid and reference ellipsoid. The geoid is essentially the shape of the earth abstracted from its topographic features. It is an idealized equilibrium surface of sea water, the mean sea level surface in the absence of currents, air pressure variations etc. and continued under the continental masses. The geoid, unlike the ellipsoid, is too complicated to serve as the computational surface on which to solve geometrical problems like point positioning .

2. A reference ellipsoid, customarily chosen to be the same size (volume) as the geoid, is described

by its semi-major axis (equatorial radius) a and flattening f. The quantity f = (a - b) / a, where b is the semi-minor axis (polar radius) is a purely geometrical one. The mechanical ellipticity of the earth (dynamical flattening) is determined by observation and differs from the geometrical because the earth is not of uniform density.
3. Co-ordinate systems in space. The locations of points in three-dimensional space are most conveniently described by three Cartesian or rectangular coordinates, X,Y and Z. Since the advent of satellite positioning, such coordinate systems are said to be typically geocentric: the Z axis is aligned with the Earth's (conventional or instantaneous) rotation axis, while the X axis lies within the Greenwich observatory's meridian plane.
4. Before the satellite geodesy era, the coordinate systems associated with geodetic datums attempted to be geocentric, but their origins differed from the geocentre by hundreds of metres, due to regional deviations in the direction of the plumbline (vertical). //These regional geodetic datums, such as ED50 (European Datum 195012) or NAD83 (North American Datum 198313) have ellipsoids associated with them that are regional 'best fits' to the geoids within their areas of validity, minimizing the deflections14 of the vertical over these areas.

10. Translate the text. (1800 printed characters; time – 45 min.)

1. In late October and early November 2009, DRDC (Минобороны Канады) collected airborne hyperspectral imagery near Suffield, Alberta (50°13'N, 110°10'W) using an Itres SASI-600 SWIR pushbroom imaging system.(съёмочная система непрерывного сканирования Itres SASI-600 SWIR (коротковолновый ИК-сенсор). 2. The sensor was flown at various altitudes ranging from 330m to 1700m above ground level in order to acquire imagery at across-track ground sampling distance (GSD) of 0.4m, 1.0m, and 2.0m, while along track GSD remained constant at 1.0m. Imagery was collected between 13h00 and 15h00 local time, which resulted in sun elevation between 17 and 25 degrees.
3. Furthermore, thin altostratus clouds and an overcast of altocumulus clouds on the first (29 Oct) and second day (03 Nov) of collect respectively degraded the illumination conditions considerably. Compared to typical reflective hyperspectral field trials usually conducted under clear skies and high solar elevation, this data collection was conducted under significantly adverse environmental conditions not often considered in the hyperspectral literature.
4. One objective of this field trial was the evaluation of the constrained energy minimization (CEM) algorithm sub-pixel abundance estimation accuracy. For this purpose, we designed targets of known abundances made of thin strips of painted metal (марированный металл). The design allowed changes to the abundance level by varying the distance between the strips of metals while their overall size (5m x 5m) ensured that they filled completely at least one pixel in the imagery. We used two different types of paint to vary the contrast between the target and background, one beige and one green.

11. Translate the text. (1800 printed characters; time – 45 min.)

1. The HYMEX project addressed applications divided in 3 categories: 1. Target detection and identification: This includes targets such as military vehicles, camouflages and various man-made materials. 2. Land mapping applications: This includes the characterization of soil and vegetation. 3. Marine mapping applications: This includes beach characterization and near-shore bathymetry, as well as water color mapping (отображение глубин гипсометрией) .
2. As mentioned in the introduction, DRDC (Минобороны Канады) developed expertise and advanced exploitation techniques for target detection over the years but had limited expertise for terrain analysis and water mapping. To identify available techniques for the last 2 categories, HYMEX conducted a survey of about 60 different groups from industry, academia and other government departments forming the Canadian remote sensing community.
3. The HYMEX project conducted several field trials at different locations across Canada to acquire remotely sensed hyperspectral imagery and ground truth for testing the various algorithms. Each location had specific characteristics likely to affect the performance of the algorithms. Marine trials were conducted in two different locations (East and West coast). Land trials were conducted in an Acadian forest, a boreal forest, an aspen dominant forest and in prairie grassland.

4. One trial was conducted in winter under snow conditions. While some space-based hyperspectral imagery was acquired, the project main data type came from airborne hyperspectral sensors.

12. Translate the text. (1800 printed characters; time – 45 min.)

1. At over 40 years, the Landsat series of satellites provides the longest temporal record of space-based land surface observations and the successful February 2013 launch of the Landsat 8 satellite is continuing this legacy.
2. The Landsat 8 payload includes the Operational Land Imager (OLI) that has a new 1375 μm band designed to monitor cirrus clouds and the Thermal Infrared Sensor (TIRS) that together provide improved cloud detection capabilities. In addition, the radiometric resolution and the dynamic range of the OLI is improved compared to previous Landsat sensors, reducing band saturation over highly reflective objects, such as snow or cloud. Landsat 8 data are nominally processed into 185 km × 180 km scenes and, unlike for previous Landsat sensors, are provided with a spatially explicit 30 m quality assessment band that includes a cloud and cirrus cloud mask.
3. Landsat data are less appropriate for quantification of cloud properties and amount compared to near daily global coverage and certain active cloud remote sensing systems although Landsat data have been valuable for cloud morphology analyses. However, quantification of the incidence of cloudiness for Landsat terrestrial monitoring applications, especially in persistently cloudy regions, is important because optically thick clouds preclude optical and thermal wavelength remote sensing of the surface.
4. The Landsat sensors are in polar orbiting sun synchronous orbits with a 16 day repeat cycle and considerable global spatial and temporal variability in cloudiness at the time of Landsat overpass.

13. Translate the text. (1800 printed characters; time – 45 min.)

1. Time is a multifaceted concept, with deeply personal and subjective meanings as well as formally constructed but still arbitrary meanings, and ontologies for time in GIScience can be as complex as they are for space in geography. At its simplest, however, and in the practice of GIScience research, it is still useful to think about space–time research challenges in three basic temporal domains: (1) past time— documenting and interpreting historical events, places, and processes; (2) future time—modeling, simulating, or projecting future spatial scenarios; and (3)real time—understanding and interacting with events, people, places, and spatial processes as they are emerging and mutually evolving in a dynamic and mobile world.
2. Although interrelated, of course, each of these simple categories has its own special set of challenges in gathering, understanding, and representing space–time integrated data. Historical time and geographic data, especially from the more distant past, are highly constrained by preexisting and frequently indefinite or inconsistent time and space categories of bygone eras.
3. Historical geographic information systems (GIS) cannot ignore and must struggle to work within and reconcile the profusion of its received categories of time and space. Future time GIScience work is less restricted, in the sense that its temporal and spatial constructs are not necessarily constrained by past categories or practices and can more freely be structured as the researcher or modeler wishes; its delineations of space or time need not be confined to those of a world or a time that is occurring or already has occurred.

14. Translate the text. (1800 printed characters; time – 45 min.)

1. Over the past 30 years, a global warming of 0.2 ″C per decade has been detected. The significant increase in temperature in the Arctic and Antarctic regions is contributing to global sea level rise, which greatly influences the living environment and socioeconomic settings of human beings living near the current mean sea level. According to Mitrovica et al., the melting of the Greenland ice complex is equivalent to 0.6 mm¨ year´1 of sea level rise over the last century. More recently,

Shepherd et al. reported that the total contribution of the polar ice sheets to sea level rise has been 0.59 ˘- 0.20 mm¨ a year´ on average since 1992 using satellite altimetry, interferometry, and gravimetry datasets, with the current rate being about 1 mm¨ a year´.
2. As a consequence, it is important to measure the surface velocity, mass and surface elevation of the Arctic and Antarctic ice sheets in order to model and simulate how they will respond to a warming climate, and to predict their contribution to sea level rise.
3. The Center for Remote Sensing of Ice Sheets (Центр дистанционного зондирования ледяных щитов (CReSIS), with the mission of developing new technologies and computer models to measure and predict the response of sea level change to the mass balance of ice sheets in the Arctic and Antarctic, collects much-needed data relevant to ice sheets and the rapid changes they are undergoing. Large amounts of geospatial data have been collected or generated from remote sensors for the advanced monitoring and investigation of the polar environment at CReSIS.

15. Translate the text. (1800 printed characters; time – 45 min.)

1. Mapping and spatial data collection are two activities that have radically changed from primarily professional domains to increased involvement of the public. This shift in activity patterns has occurred as a result of significant technological advances during the last decade. This includes the ability to create content online more easily through Web 2.0, the proliferation of mobile devices that can record the location of features, and open access to satellite imagery and online maps.
2. The literature describes this phenomenon using a multitude of terms, which have emerged from different disciplines; some are focused on the spatial nature of the data such as volunteered geographic information (VGI) and neogeography , while others have much broader applicability, e.g., crowdsourcing, citizen science and user-generated content, to name but a few.
3. Despite their differences, these terms are often used interchangeably to capture the same basic idea of citizen involvement in carrying out various activities relating to geographic information science. These activities can be driven by the needs of a second party such as a commercial company needing to outsource micro-tasks or by researchers who need large data sets collected that would otherwise not be possible using their own resources.
4. Citizens may be motivated to contribute for a diverse set of reasons. The participants involved might, for instance, feel compelled to contribute by a collective cause such as contributing to an open map of the world through OpenStreetMap. Another motivation is simply the desire to share information more widely, by, for example, placing georeferenced photographs online via a site like Panoramio or georeferenced commentary captured via Twitter. Whatever the motivation for collecting and sharing the data, these systems have become important sources of geographical data and are now being used by others for applications that may be unforeseen by the contributors, such as scientific research.

16. Translate the text. (1800 printed characters; time – 45 min.)

1. There are many applications of global population density datasets, with particular relevance for urban and regional research, international development and natural hazard risk. This paper describes the creation of an interactive map of the population data to allow researchers and the general public to quickly and intuitively view spatial patterns and statistics from the dataset.
2. The interactive map is viewable at the site http://luminocity3d.org/WorldPopDen. The aim of the map is to be relevant for a range of users who are interested in a variety of study areas and scales of analysis. This scale flexibility is a strength of interactive mapping. The cartographic solution implemented here was firstly to use the multiple data scales available in the population data for different zoom levels in the interactive map. Secondly, a carefully designed data classification and colour scheme was developed to differentiate the main rural, suburban, urban and super-urban density patterns in the dataset. And lastly, interactive statistics are provided at both national and city level scales displaying numerical comparisons in population and density, including change over time statistics using the temporal Glasgow University (GU) data.

3. The aim of the global population density map is to clearly display density patterns across a range of spatial scales, specifically from continental perspectives to more detailed national and city-region scales. This range of scales is intended to take advantage of the high-resolution data available in GU, expanding the variety of users and applications that the map is relevant to.
4. Two GU raster data products are included in the map: the 1 km cell resolution 2015 population data and the more detailed 250 m cell resolution 2015 population data. The different data resolutions are used at different viewing scales to improve data legibility. The 1 km data is used for continental and national scale maps, as shown in Figure 1 for the examples of Europe and East Asia. The 250 m data is used for regional scale maps.

17. Translate the text. (1800 printed characters; time – 45 min.)

The Definition and Significance of Boundaries in Surveying

Boundary definition stands as one of the most crucial responsibilities in the field of surveying, serving as the foundation for property rights and land management. This complex process involves much more than simply measuring distances - it requires a careful blend of legal interpretation, historical research, and precise measurement techniques to establish clear and indisputable property lines.

At its core, boundary determination begins with a thorough examination of legal documents. Surveyors meticulously analyze deeds, historical surveys, and land records to understand the original intent behind property divisions. This paper trail often reveals fascinating insights into how communities have evolved over time, with some boundary disputes tracing back centuries. The surveyor's role as an interpreter of these documents makes them an essential bridge between the legal system and physical land use.

Modern technology has revolutionized boundary surveys while maintaining their traditional importance. While surveyors still use fundamental tools like theodolites and measuring tapes, they now integrate advanced solutions such as GPS and GNSS receivers that provide centimeter-level accuracy. These technological advancements work in tandem with traditional methods - a surveyor might use satellite positioning to verify the location of an old stone marker mentioned in a 19th-century deed.

The physical marking of boundaries remains a tangible and critical part of the process. Surveyors install durable monuments at key points, choosing materials designed to withstand environmental changes. These markers range from simple iron rods to elaborate engraved stones, each serving as a permanent reference for future surveys. The placement of each marker carries significant legal weight, making precision absolutely essential.

Boundary surveys frequently encounter challenges that test a surveyor's expertise. Discrepancies between historical records and current land use often emerge, requiring careful reconciliation. Natural processes like erosion or tree growth can obscure original markers, while human activities sometimes lead to accidental or intentional encroachments. In these situations, surveyors must combine technical skills with diplomatic acumen to resolve conflicts.

The importance of accurate boundary definition extends far beyond individual properties. Well-defined boundaries form the backbone of functional communities, enabling proper land development, rational urban planning, and fair taxation systems. They provide the framework for infrastructure projects, environmental protection efforts, and disaster management planning. In essence, the work of boundary surveyors helps maintain the fundamental order of our physical and legal landscapes.

As populations grow and land becomes increasingly valuable, the role of boundary surveyors will only grow in importance. Their unique combination of technical precision, historical knowledge, and legal understanding makes them indispensable in creating and maintaining the invisible lines that shape our world. The next time you see a surveyor at work, remember they're not just measuring land - they're preserving a system of ownership and use that forms the foundation of modern society.

18. Translate the text. (1800 printed characters; time – 45 min.)

Technical Limitations in Boundary Surveying: Navigating the Gaps Between Theory and Practice

Boundary surveying, while increasingly supported by advanced technologies, still faces inherent

technical limitations that challenge even the most experienced professionals. These constraints affect measurement accuracy, data interpretation, and the reconciliation of modern surveys with historical records, often creating complex situations in the field.

1. Accuracy Limitations of Measurement Tools

Modern surveying instruments, though precise, are not infallible. GNSS receivers—while capable of centimeter-level accuracy under ideal conditions—face signal interference in urban canyons, under heavy tree canopies, or near power lines. Total stations and electronic distance measurement (EDM) devices are similarly affected by atmospheric conditions like humidity and temperature fluctuations, requiring constant calibration. These physical constraints mean that even with high-end equipment, measurements always carry a margin of error that surveyors must account for in their final determinations.

2. Challenges with Historical Data Integration

Many boundary surveys require correlating contemporary measurements with historical records that used different technologies and standards. Older surveys might reference chains, rods, or varas—units no longer in common use—with conversion factors that introduce rounding errors. Some 19th-century surveys relied on magnetic bearings rather than true north, creating discrepancies when overlaying them on modern coordinate systems. Surveyors often struggle to match the precision of current tools with the inherent imprecision of legacy data, leading to interpretation challenges.

3. Limitations in Marker Detection

Even with ground-penetrating radar (GPR) and metal detectors, locating original boundary monuments can be problematic. Iron pins may have corroded, stone markers might have been moved or buried under decades of soil accumulation, and wooden stakes often rot away entirely. In some cases, natural features like trees or rocks referenced in old deeds have disappeared without trace. These gaps force surveyors to rely on indirect evidence and professional judgment, introducing subjectivity into what should be an objective process.

As boundary surveying continues to evolve with new technologies like AI-assisted analysis and improved sensor networks, these technical limitations will gradually diminish—but likely never disappear entirely. The profession's strength lies in its practitioners' ability to navigate these constraints while maintaining the integrity of property boundaries that form the foundation of land ownership systems worldwide.

19. Translate the text. (1800 printed characters; time – 45 min.)

Technical Limitations in Boundary Surveying: Navigating the Gaps Between Theory and Practice

Boundary surveying, while increasingly supported by advanced technologies, still faces inherent technical limitations that challenge even the most experienced professionals. These constraints affect measurement accuracy, data interpretation, and the reconciliation of modern surveys with historical records, often creating complex situations in the field.

1.Software and Data Processing Constraints

While CAD and GIS software have revolutionized surveying, they present their own limitations. Coordinate rounding in digital systems can create small but meaningful discrepancies when working with large datasets. Different software platforms may interpret survey data slightly differently, especially when handling complex boundary curves or irregular parcels. Additionally, the transition from paper-based plats to digital formats sometimes introduces errors during scanning or georeferencing of historical documents.

2. Line-of-Sight and Terrain Challenges

Traditional surveying methods still rely on line-of-sight measurements, which can be obstructed by terrain features like hills, buildings, or dense vegetation. In rugged or inaccessible areas, surveyors may need to compromise on optimal measurement points, potentially affecting accuracy. Even drone-based LiDAR surveys face limitations in heavily wooded areas where laser pulses cannot penetrate to ground level.

3. Temporal Factors in Measurements

Boundary surveys conducted at different times may yield varying results due to seasonal changes.

Frozen ground in winter affects tripod stability, while summer foliage blocks GNSS signals. More fundamentally, tectonic plate movement (up to several centimeters per year in active regions) means that coordinates are technically always in flux, though this is rarely accounted for in local surveys.

Mitigating Technical Limitations

Surveyors address these challenges through redundancy (multiple measurement methods), rigorous error analysis, and clear documentation of uncertainties. They combine technologies—using GNSS where possible and supplementing with total stations or tape measurements where necessary. Most importantly, they recognize that technology provides tools rather than absolute answers, maintaining a healthy skepticism about any single data source.

20. Translate the text. (1800 printed characters; time – 45 min.)

BIM-Enabled Surveys: Transforming Construction Documentation

Building Information Modeling (BIM) has revolutionized the construction industry by enabling more accurate, efficient, and collaborative project management. One of its significant applications is in the realm of surveys, where BIM-enabled surveys enhance the precision and usability of site data.

Traditional surveying methods often involve manual measurements and paper-based documentation, which can be time-consuming and prone to errors. In contrast, BIM-enabled surveys utilize advanced technologies like laser scanning and drone imaging to capture highly detailed 3D data of existing structures and sites. This data is then integrated directly into BIM software, creating comprehensive digital models.

The advantages of BIM-enabled surveys are numerous. They allow for rapid data collection that reduces on-site time and minimizes disruptions. The detailed models facilitate better clash detection, enabling teams to identify potential conflicts early in the design process. Additionally, BIM models serve as valuable as-built references for renovation or maintenance projects, ensuring accuracy and reducing rework.

Furthermore, BIM-enabled surveys support collaborative workflows by providing stakeholders with shared, up-to-date digital models. This openness enhances communication, coordination, and decision-making throughout the project lifecycle.

In summary, BIM-enabled surveys represent a significant step forward in construction documentation, offering increased accuracy, efficiency, and collaboration. As technology advances, their role in delivering smarter, more sustainable projects will only grow, shaping the future of construction practices.

21. Look through the text and describe types of surveys (preparation time - 15 min.).

SPECIALIZED TYPES OF SURVEYS

Many types of surveys are so specialized that a person proficient in a particular discipline may have little contact with the other areas. Persons seeking careers in surveying and mapping, however, should be knowledgeable in every phase, since all are closely related in modern practice. Some important classifications are described briefly here.

Topographic surveys determine locations of natural and artificial features and elevations used in map making.

Land, boundary, and cadastral surveys establish property lines and property corner markers. The term cadastral is now generally applied to surveys of the public lands systems. There are three major categories: original surveys to establish new section corners in unsurveyed areas that still exist in Alaska and several western states; retracement surveys to recover previously established boundary lines; and subdivision surveys to establish monuments and delineate new parcels of ownership. Condominium surveys, which provide a legal record of ownership, are a type of boundary survey.

Ground, aerial, and satellite surveys are broad classifications sometimes used. Ground surveys utilize measurements made with ground-based equipment such as automatic levels and total station instruments. Aerial surveys are accomplished using either photogrammetry or remote sensing. Photogrammetry uses cameras that are carried usually in airplanes to obtain images, whereas remote sensing employs cameras and other types of sensors that can be transported in either aircraft or satellites. Procedures for analyzing and reducing the image data are described further. Aerial

methods have been used in all the specialized types of surveys listed, except for optical tooling, and in this area terrestrial (ground-based) photographs are often used. Satellite surveys include the determination of ground locations from measurements made to satellites using GNSS receivers, or the use of satellite images for mapping and monitoring large regions of the Earth.

22. Look through the text and describe height determination (preparation time - 15 min.).

HEIGHT DETERMINATION

Heights of surface features above sea level are determined in four main ways: by spirit leveling, by measuring vertical angles and distances, by measuring differences in atmospheric pressure, and, since the late 20th century, by using three-dimensional satellite or inertial systems. Of these the first is the most accurate; the second is next in accuracy but faster; the third is least accurate but can be fastest if heights are to be measured at well-separated points. The last two techniques require sophisticated equipment that is still very expensive.

In spirit leveling the surveyor has for centuries used a surveying level, which consists of a horizontal telescope fitted with cross hairs, rotating around a vertical axis on a tripod, with a very sensitive spirit level fixed to it; the instrument is adjusted until the bubble is exactly centred. The reading on a graduated vertical staff is observed through the telescope. If such staffs are placed on successive ground points, and the telescope is truly level, the difference between the readings at the cross hairs will equal that between the heights of the points. By moving the level and the staffs alternately along a path or road and repeating this procedure, differences in height can be accurately measured over long horizontal distances.

In the most precise work, over a distance of 100 kilometres the error may be kept to less than a centimeter. To achieve this accuracy great care has to be taken. The instrument must have a high-magnification telescope and a very sensitive bubble, and the graduated scale on the staff must be made of a strip of invar (an alloy with a very small coefficient of thermal expansion). Moreover, the staffs must be placed on pegs or special heavy steel plates, and the distance between them and the level must always be the same to cancel the effects of aerial refraction of the light.

In less precise work a single wooden staff can be used; for detailed leveling of a small area, the staff is moved from one point to another without moving the level so that heights can be measured with a radius of about 100 metres. The distances of these points from the instrument can be measured by tape or more commonly, by recording not only the reading at the central cross hair in the field of view of the telescope but also those at the stadia hairs, that is by tachymetry. The bearing of each point is observed by compass or on the horizontal circle of the level so that it can be plotted or drawn on the map.

23. Can you describe the Universal Transverse Mercator (UTM) system? (preparation time – 15 min.)

There are many purposes for which large-scale air photographs are required, other than for the making of maps. Such cases are erosion surveys, forest inventory surveys, land-use surveys and many others. It may often prove economical to use aerial photography that meets the needs of the cadastral survey and to make maps on this basis, even though the cost of such photography would not be justified solely for the purposes of cadastral mapping.

The general conclusions drawn from the above observations may be stated as follows:

1.Where air surveys are part of the ordinary survey practice of a country, they may also prove suitable for large cadastral jobs, provided that the amount of supplementary ground work required is not so large as to make it more economical to use ground staff alone. In such cases it may be economical to use photography of sufficiently large scale to meet the needs of cadastral surveying even though this exceeds the requirements of other mapping projects. To carry out a dual or multiple purpose survey through one set of photographs may make economic sense. Often however the needs of different applications of the photography are incompatible and multiple sets of photography may be required.

2.Where a new cadastral survey of a large area is required to be carried out quickly, air survey is often the best practical method, unless a great deal of supplementary ground work proves necessary.

3.Unless reasonably full-time employment can be found for the staff and equipment of a national mapping agency's air survey department, it will usually be better to contract the work out to a

commercial agency.
4.Cadastral surveys of small areas, extensions to existing surveys, and revision work will usually best be done by the ground staff of the national cadastral survey organization, according to a continuous programme.

24. Look through the text and describe surveying computerization (preparation time - 15 min.).

Here, we review the impact of computers on the surveying and mapping of land parcels, and on the recording and dissemination of land-related information. The main advantage of computerization is the speed with which data may be handled.
Computers can, inter alia, be used to:
a. speed up the collection and processing of cadastral survey data;
b. make significant reductions in the cost and space required for storing and retrieving land records;
c. prevent unnecessary duplication of records;
d. simplify the preparation of "back-up" copies of registers in case of disaster;
e. accelerate the processing of data for the first registration of title;
f. reduce the time and cost involved in transferring property rights and in processing mortgages;
g. facilitate the monitoring and analysis of market and rental values of land and property;
h. provide better estimates of the value of land for taxation or compulsory acquisition;
i. improve efficiency and effectiveness in collecting land and property taxes;

The list of possible applications of information technology (IT) is almost endless. It is often as valid to ask whether a country can afford to be without a good computerized land information system as it is to ask whether it can afford to install one.
Computerization speeds up the processes of field and photogrammetric survey, the storage, retrieval and analysis of data, and the preparation and production of cadastral maps and plans. Automatic data recording has two advantages - it reduces the human mistakes that occur in writing down and subsequently transcribing field survey observations, and it facilitates the transfer of data for subsequent computation and adjustment. In spite of the increased cost of modern surveying equipment, productivity can be significantly increased through the use of computers. This then makes it possible to reduce the unit costs of survey.

25. Look through the text and describe the 3D modelling? (preparation time - 15 min.).

When planning a 3D surveying and modeling project, beside all the technical parameters that should be kept in mind (e.g. location, accessibility, geometric detail, budget), a very crucial thing to know is the final user of the 3D data and the final project's goal, in order to clarify what is actually needed.
Nowadays there is a large number of geomatics data acquisition tools for mapping purposes and for visual Cultural Heritage digital recording. These include satellite imagery, digital aerial cameras, radar platforms, airborne and terrestrial laser scanners, UAVs, panoramic linear sensors, SRL or consumer-grade terrestrial digital cameras and GNSS/INS systems for precise positioning. Beside data acquisition systems, today new software has been developed and many automated data processing procedures are available. For what concerned new functionality for 3D data management, there are new advances in Geographic Information Systems (GIS) and 3D repositories (e.g. BIM) while in the visualization field the rendering and animation software are now more affordable with lower costs and higher results. The continuous development of new sensors, data capture methodologies and multi-resolution 3D representations are contributing significantly to the documentation, conservation, and presentation of heritage information and to the growth of research in the Cultural Heritage field. The generation of reality-based 3D models of heritage sites and objects is nowadays performed using methodologies based on passive sensors and image data, active sensors and range data, classical surveying (e.g. total stations or GNSS), 2D maps, or an integration of the aforementioned techniques.

26. Look through the text and describe hydrographic surveying (preparation time - 15 min.).

HYDROGRAPHY

Surveying of underwater features, or hydrographic surveying, formerly required techniques very different from ground surveying, for two reasons: the surveyor ordinarily was moving instead of

stationary, and the surface being mapped could not be seen. The first problem, making it difficult to establish a framework except near land or in shoal areas, was dealt with by dead reckoning between points established by astronomical fixes. In effect a traverse would be run with the ship's bearing measured by compass and distances obtained either by measuring speed and time or by a modern log that directly records distances. These have to be checked frequently, because however accurate the log or airspeed indicator and compass, the track of a ship or aircraft is not the same as its course. Crosscurrents or winds continually drive the craft off course, and those along the course affect the speed and the distance run over the ground beneath.

The only way a hydrographer could chart the seabed before underwater echo sounding and television became available was to cast overboard at intervals a sounding line with a lead weight at the end and measure the length of the line paid out when the weight hit the bottom. The line was marked in fathoms, that is, units of one one-thousandth of a nautical mile, or approximately six feet (1,8 metres).

Sounding by lead is obviously very slow, especially in deep waters, and the introduction of echo sounding in the early 20th century marked a great improvement. It was made possible by the invention of electronic devices for the measurement of short intervals of time. Echo sounding depends on timing the lapse between the transmission of a short loud noise or pulse and its return from the target – in this case the bottom of the sea or lake. Sound travels about 5,000 feet (1.500 metres) per second in water, so that an accuracy of a few milliseconds in measurements of the time intervals gives depths within a few feet.

27. Look through the text and describe Very Long Base Interferometry and Global Navigation Systems (preparation time - 15 min.).

VLBI observes radio signals emitted by quasars. These fixed points constitute the ICRF, and variations in the orientation of the Earth are measured with respect to the ICRF. This technique is sensitive to processes that change the relative position of the radio telescopes with respect to the source, such as a change in the orientation of the Earth in space or a change in the position of the telescopes due to, for example, tidal displacements or tectonic motions. If just two telescopes are observing the same source, then only two components of the Earth's rotation can be determined. A rotation of the Earth about an axis parallel to the baseline connecting the two radio telescopes does not change the relative position of the telescopes with respect to the source, and hence this component of the Earth's orientation is not determinable from VLBI observations taken on that single baseline. Multibaseline VLBI observations with satisfactory geometry can determine all of the components of the Earth's rotation including their time rates-of-change. In fact, the motion of the axis of rotation of the Earth in space (precession and nutation) and the rotation angle around the axis of rotation are uniquely monitored by VLBI through its direct connection to the ICRF.

GNSS: GNSS signals observed by a network of ground stations can be used to determine the orientation of the network of receivers as a whole. In practice, in order to achieve higher accuracy, more sophisticated analysis techniques are employed to determine the EOPs and other quantities such as orbital parameters of the satellites, positions of the stations, and atmospheric parameters such as the zenith path delay. Only polar motion and its time rateof-change can be independently determined from GNSS measurements. UT1 cannot be separated from the orbital elements of the satellites and hence cannot be determined from GNSS data. The time rate-of-change of UT1, which is related to the length of the day, can be determined from GNSS measurements. But because of the corrupting influence of orbit error, VLBI measurements are usually used to constrain the GNSS-derived Length of Day (LOD) estimates.

28. Look through the text and describe Horizontal Angles (preparation time – 15 min.)

KINDS OF HORIZONTAL ANGLES

The kinds of horizontal angles most commonly observed in surveying are (1) interior angles, (2) angles to the right, and (3) deflection angles. Because they differ considerably, the kind used must be clearly indicated in field notes. Interior angles are observed on the inside of a closed polygon. Normally the angle at each apex within the polygon is measured. Then, a check can be made on their values because the sum of all interior angles in any polygon must equal (n – 2) 180 o where n – is the number of angles. Polygons are commonly used for boundary surveys and many other types of work. Surveyors (geomatics engineers) normally refer to them as closed traverses.

Exterior angles, located outside a closed polygon, are explements (пополнение угла до 360 град.) of interior angles. The advantage to be gained by observing them is their use as another check, since the sum of the interior and exterior angles at any station must total 360°.
Angles to the right are measured clockwise from the rear to the forward station. Note: As a survey progresses, stations are commonly identified by consecutive alphabetical letters, or by increasing numbers. Most data collectors require that angles to the right be observed in the field.

29. Look through the text and describe MERIDIANS (preparation time – 15 min.)

DIRECTION OF A LINE

The direction of a line is defined by the horizontal angle between the line and an arbitrarily chosen reference line called a meridian. Different meridians are used for specifying directions including (a) geodetic (also often called true), (b) astronomic, (c) magnetic, (d) grid, (e) record, and (f) assumed.
The geodetic meridian is the north-south reference line that passes through a mean position of the Earth's geographic poles. The positions of the poles defined as their mean locations between the period of 1900.0 and 1905.0 (see Section 19.3).
Wobbling (прецессия) of the Earth's rotational axis causes the position of the Earth's geographic poles to vary with time. At any point, the astronomic meridian is the north-south reference line that passes through the instantaneous position of the Earth's geographic poles. Astronomic meridians derive their name from the field operation to obtain them, which consists in making observations on the celestial objects. Geodetic and astronomic meridians are very nearly the same, and the former can be computed from the latter by making small corrections.
A magnetic meridian is defined by a freely suspended magnetic needle that is only influenced by the Earth's magnetic field.
Surveys based on a state or other plane coordinate system employ a grid meridian for reference. Grid north is the direction of geodetic north for a selected central meridian and held parallel to it over the entire area covered by a plane coordinate system.

30. Look through the text and describe AZIMUTHS and BEARING (preparation time – 15 min.)

Look through the text and describe AZIMUTHS and BEARING (preparation time – 15 min.)

AZIMUTHS

Azimuths are horizontal angles observed clockwise from any reference meridian. In plane surveying, azimuths are generally observed from north, but astronomers and the military have used south as the reference direction. The National Geodetic Survey (NGS) also used south as its reference for azimuths for NAD27, but north has been adopted for NAD83.

BEARINGS

Bearings are another system for designating directions of lines. The bearing of a line is defined as the acute horizontal angle between a reference meridian and the line. The angle is observed from either the north or south toward the east or west, to give a reading smaller than 90°.The letter N or S preceding the angle, and E or W following it shows the proper quadrant. Thus, a properly expressed bearing includes quadrant letters and an angular value. An example is N80°E.

31. Look through the text and describe GLONASS (preparation time – 15 min.)

Like other GNSS systems, GLONASS relies on a constellation of satellites transmitting synchronized signals. A receiver calculates its position by measuring the time delay of signals from at least four satellites. Key features include:
- Satellites: 24 operational satellites in Medium Earth Orbit (MEO) at ~19,100 km altitude.
- Orbital Planes: Three orbital planes (8 satellites each) inclined at 64.8°.
-Accuracy: ~2–8 meters (civilian), with military signals being more precise.
Satellite navigation devices supporting both GPS and GLONASS have more satellites available, meaning positions can be fixed more quickly and accurately, especially in built-up areas where buildings may obscure the view to some satellites. GLONASS supplementation of GPS systems also improves positioning in high latitudes (north or south).

Development of GLONASS began in the Soviet Union in 1976. Beginning on 12 October 1982, numerous rocket launches added satellites to the system until the completion of the constellation in 1995. In 2001, after a decline in capacity during the late 1990s, the restoration of the system was made a government priority, and funding increased substantially. GLONASS is the most expensive program of the Roscosmos, consuming a third of its budget in 2010.
By 2010, GLONASS had achieved full coverage of Russia's territory. Russia continues to upgrade GLONASS with:
- GLONASS-K2 (2020s): Next-gen satellites with improved CDMA signals.
- GLONASS-KM (2030s): Planned advanced satellites for enhanced precision.
- Integration with Other Systems: Some receivers combine GPS + GLONASS + Galileo + BeiDou for maximum accuracy.
GLONASS ensures Russia’s independence in global navigation while contributing to worldwide GNSS services. Despite challenges, it remains a key player in satellite positioning technology, complementing other systems for better reliability and coverage.

32. Look through the text and describe GIS (preparation time – 15 min.)

A geographic information system (GIS) consists of integrated computer hardware and software that store, manage, analyze, edit, output, and visualize geographic data. Much of this often happens within a spatial database, however, this is not essential to meet the definition of a GIS. In a broader sense, one may consider such a system also to include human users and support staff, procedures and workflows, the body of knowledge of relevant concepts and methods, and institutional organizations.
The uncounted plural, geographic information systems, also abbreviated GIS, is the most common term for the industry and profession concerned with these systems. It is roughly synonymous with geoinformatics. The academic discipline that studies these systems and their underlying geographic principles, may also be abbreviated as GIS, but the unambiguous GIScience is more common. GIScience is often considered a subdiscipline of geography within the branch of technical geography.
Geographic information systems are utilized in multiple technologies, processes, techniques and methods. They are attached to various operations and numerous applications, that relate to: engineering, planning, management, transport/logistics, insurance, telecommunications, and business. For this reason, GIS and location intelligence applications are at the foundation of location-enabled services, which rely on geographic analysis and visualization.

33. Look through the text and describe the relevance of classical surveying methods (preparation time – 15 min.)

In the era of GPS, GNSS, LiDAR, and drone mapping, the question arises: “Do modern surveyors still need to learn classical techniques like triangulation, trilateration, and plane table surveying?”
The Continued Relevance of Classical Surveying Methods in the Digital Age
With the widespread adoption of GPS, GNSS, LiDAR, and drone mapping technologies, some may question whether traditional surveying techniques like triangulation, trilateration, and plane table surveying still hold value. The reality is that these classical methods remain an essential part of a surveyor's skill set, complementing modern technology rather than being replaced by it.
1. Building a Strong Theoretical Foundation
Modern surveying technologies are built upon the same geometric and mathematical principles used in classical methods. Understanding triangulation (angle-based measurements) and trilateration (distance-based calculations) helps surveyors grasp how satellite positioning works. Without this knowledge, interpreting GNSS data or troubleshooting errors becomes significantly more difficult.
2. Ensuring Reliability When Technology Fails
While GNSS provides fast and efficient measurements, it is not infallible. Signal obstructions in urban environments, dense forests, or underground sites can render satellite-based positioning unreliable. Additionally, electronic equipment may malfunction due to battery failure, software glitches, or harsh weather conditions. In such scenarios, classical surveying techniques serve as a dependable backup, ensuring continuity in fieldwork.
3. Validating and Retracing Historical Surveys
Many existing land records, property boundaries, and topographic maps were originally surveyed using traditional methods. When resurveying or verifying these records, familiarity with plane table

surveys, theodolite measurements, and chain surveying is crucial. Ignoring classical techniques can lead to misinterpretations of old data, resulting in legal disputes or costly errors.

Conclusion: The Best Surveyors Blend Old and New

While modern technology has revolutionized surveying, classical methods remain indispensable. A skilled surveyor must be proficient in both traditional techniques and cutting-edge tools—ensuring accuracy, adaptability, and problem-solving ability in any situation.

34. Look through the text and describe the Definition and Significance of Boundaries in Surveying (preparation time – 15 min.)

The Definition and Significance of Boundaries in Surveying

Boundary definition stands as one of the most crucial responsibilities in the field of surveying, serving as the foundation for property rights and land management. This complex process involves much more than simply measuring distances - it requires a careful blend of legal interpretation, historical research, and precise measurement techniques to establish clear and indisputable property lines.

At its core, boundary determination begins with a thorough examination of legal documents. Surveyors meticulously analyze deeds, historical surveys, and land records to understand the original intent behind property divisions. This paper trail often reveals fascinating insights into how communities have evolved over time, with some boundary disputes tracing back centuries. The surveyor's role as an interpreter of these documents makes them an essential bridge between the legal system and physical land use.

Modern technology has revolutionized boundary surveys while maintaining their traditional importance. While surveyors still use fundamental tools like theodolites and measuring tapes, they now integrate advanced solutions such as GPS and GNSS receivers that provide centimeter-level accuracy. These technological advancements work in tandem with traditional methods - a surveyor might use satellite positioning to verify the location of an old stone marker mentioned in a 19th-century deed.

The physical marking of boundaries remains a tangible and critical part of the process. Surveyors install durable monuments at key points, choosing materials designed to withstand environmental changes. These markers range from simple iron rods to elaborate engraved stones, each serving as a permanent reference for future surveys. The placement of each marker carries significant legal weight, making precision absolutely essential.

35. Look through the text and describe TRIANGULATION (preparation time – 15 min.)

TRIANGULATION

A system of triangles usually affords superior horizontal control. All of the angles and at least one side (the base) of the triangulation system are measured. Though several arrangements can be used, one of the best is the quadrangle or a chain of quadrangles. Each quadrangle, with its four sides and two diagonals, provides eight angles that are measured. To be geometrically consistent, the angles must satisfy three so-called angle equations and one side equation. That is to say the three angles of each triangle, which add to 180°, must be of such sizes that computation through any set of adjacent triangles with the quadrangles will give the same values for any side. Ideally, the quadrangles should be parallelograms. If the system is connected with previously determined stations, the new system must fit the established measurements.

When the survey encompasses an area large enough for the Earth's curvature to be a factor, an imaginary mathematical representation of the Earth must be employed as a reference surface. A level surface at mean sea level is considered to represent the Earth's size and shape, and this is called the geoid. Because of gravity anomalies, the geoid is irregular; however, it is very nearly the surface generated by an ellipse rotating on its minor axis – i.e. an ellipsoid slightly flattened at the ends, or oblate. Such a figure is called a spheroid. //Several have been computed by various authorities; the one usually used as a reference surface by English-speaking nations is (Alexander Ross) Clarke's Spheroid of 1866. This oblate spheroid has a polar diameter about 27 miles (43 kilometres) less than its diameter at the Equator.

36. Look through the text and describe Limitations in Marker Detection (preparation time – 15 min.)

Limitations in Marker Detection

Even with ground-penetrating radar (GPR) and metal detectors, locating original boundary monuments can be problematic. Iron pins may have corroded, stone markers might have been moved or buried under decades of soil accumulation, and wooden stakes often rot away entirely. In some cases, natural features like trees or rocks referenced in old deeds have disappeared without trace. These gaps force surveyors to rely on indirect evidence and professional judgment, introducing subjectivity into what should be an objective process.

As boundary surveying continues to evolve with new technologies like AI-assisted analysis and improved sensor networks, these technical limitations will gradually diminish—but likely never disappear entirely. The profession's strength lies in its practitioners' ability to navigate these constraints while maintaining the integrity of property boundaries that form the foundation of land ownership systems worldwide.

37. Look through the text and describe Purposes of Mining Surveys (preparation time – 15 min.)

Mining Surveys: An Overview

Mining surveys (маркшейдерская съемка) are essential processes in the exploration, development, and management of mineral resources. They involve the systematic measurement and mapping of underground and surface features to accurately locate mineral deposits, plan mining operations, and ensure safety and efficiency.

Purpose of Mining Surveys

1. Exploration and Prospecting: Identifying potential mineral deposits by mapping geological features and conducting geophysical and geochemical surveys.
2. Mine Planning and Design: Creating detailed maps of the mine site, including ore bodies, rock formations, and existing infrastructure to optimize extraction processes.
3. Mine Development: Assisting in the layout of tunnels, shafts, and other underground structures with precise measurements.
4. Monitoring and Safety: Tracking ground movement, deformation, and subsidence to prevent accidents and ensure the safety of workers.
5. Resource Estimation: Calculating the volume and grade of mineral deposits to determine their economic viability.

Types of Mining Surveys

- Surface Surveys: These include topographical surveys, geological mapping, and drilling surveys conducted on the surface to understand the terrain and locate mineral deposits.
- Underground Surveys: Focused on mapping underground tunnels, shafts, and ore bodies, often using advanced instruments like total stations, laser scanners, and GPS.
- Monitoring Surveys: Regular surveys to observe ground movement, deformation, or subsidence, especially in open-pit and underground mines.

38. Look through the text and describe equipment that is used in mining surveys (preparation time – 15 min.)

Mining surveys are essential processes in the exploration, development, and management of mineral resources. They involve the systematic measurement and mapping of underground and surface features to accurately locate mineral deposits, plan mining operations, and ensure safety and efficiency.

Techniques and Instruments

- Total Station: A versatile instrument combining electronic distance measurement and angular measurement for precise mapping.
- GPS (Global Positioning System): Used for accurate positioning on the surface and sometimes

underground with specialized equipment.
- Laser Scanning and 3D Modeling: Provide detailed 3D representations of underground and surface features.
- Photogrammetry: Uses aerial photographs to create detailed maps and models of large areas.
Importance of Accurate Mining Surveys
Accurate surveys are vital for minimizing operational costs, maximizing resource recovery, ensuring safety, and complying with legal and environmental regulations. They form the backbone of effective mine management by providing reliable data for decision-making.
Mining surveys play a crucial role in the mining industry, enabling efficient exploration, planning, and operational safety. Advancements in technology continue to enhance the precision and scope of these surveys, contributing to more sustainable and productive mining practices.

39. Look through the text and describe Modern Surveying equipment (preparation time – 15 min.)

Modern Surveying Equipment: Revolutionizing Precision and Efficiency
Surveying has undergone a technological revolution in recent decades, with advanced equipment transforming how professionals measure, map, and analyze land. Modern tools offer unprecedented accuracy, speed, and versatility, enabling surveyors to tackle complex projects with greater confidence and efficiency.
1. Global Navigation Satellite Systems (GNSS)
GNSS receivers, including GPS, GLONASS, Galileo, and BeiDou systems, have become indispensable for boundary surveys, construction layout, and geodetic control. Modern multi-frequency receivers achieve centimeter-level accuracy in real-time (RTK) or through post-processing. These systems allow surveyors to establish precise coordinates without needing line-of-sight to traditional control points, revolutionizing large-area surveys and remote location work.
2. Robotic Total Stations
Today's robotic total stations combine electronic distance measurement (EDM), angle sensors, and automated tracking capabilities. A single operator can control the instrument remotely via a data collector or tablet, significantly improving productivity. Advanced models feature automatic target recognition, 360-degree prisms, and integrated cameras for visual documentation. These systems excel in construction surveys, monitoring applications, and detailed topographic mapping.
3. 3D Laser Scanning (LiDAR)
Terrestrial and mobile LiDAR systems capture millions of precise 3D measurements per second, creating highly detailed point clouds of structures, terrain, and infrastructure. This technology proves invaluable for as-built documentation, heritage preservation, and complex industrial surveys where traditional methods would be impractical. Airborne LiDAR mounted on drones or aircraft efficiently maps large areas, penetrating vegetation to reveal ground surfaces.

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Unmanned Aerial Vehicles (UAVs/Drones)

Equipped with high-resolution cameras, multispectral sensors, or LiDAR payloads, surveying drones provide rapid aerial data collection for topographic mapping, volumetrics, and progress monitoring. Photogrammetric processing creates orthomosaics and digital surface models with centimeter accuracy. Drones particularly shine in hazardous or inaccessible areas, reducing safety risks while cutting survey time dramatically.

Ground Penetrating Radar (GPR)

GPR systems help surveyors locate underground utilities, rebar in concrete, and buried survey markers non-destructively. By emitting high-frequency radio waves and analyzing reflections, these tools reveal subsurface features invisible to the naked eye, preventing costly excavation errors and improving the reliability of boundary retracement.

Mobile Mapping Systems

Vehicle-mounted systems integrate GNSS, inertial measurement units (IMUs), LiDAR, and cameras to capture georeferenced data at highway speeds. These solutions revolutionized road surveys, utility mapping, and corridor documentation, providing comprehensive datasets with minimal traffic disruption.

41. Answer the question:

What role has computerization played in surveying?

42. Answer the question:

What are the principles the GPS is based on?

43. Answer the question:

What kinds of surveys are you familiar with?

44. Answer the question:

What three terms are you familiar with meaning “surveying”?

45. Answer the question:

What event has changed the procedures of surveying?

46. Answer the question:

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47. Answer the question:

What event has changed the procedures of surveying?

48. Answer the question:

What GNSS systems are you familiar with?

49. Answer the question:

What is the total station used for?

50. Answer the question:

What classical surveying methods are you familiar with?

51. Answer the question:

Why is it important to have correct maps?

52. Answer the question:

What do they measure in geodesy?

53. Answer the question:

Has computerization played any role in surveying?

54. Answer the question:

What event became the advent of space geodesy?

55. Answer the question:

What definition can be given of geodesy?

56. Answer the question:

What modern surveying methods do you know?

57. Answer the question:

What modern surveying equipment are you familiar with?

58. Answer the question:

What is GIS?

59. Answer the question:

What two types of surveys are you familiar with?

60. Answer the question:

In what way has the launching of artificial satellites changed the profession of a surveyor?