

МИНИСТЕРСТВО ОБРАЗОВАНИЯ РЕСПУБЛИКИ БЕЛАРУСЬ
Учреждение образования
«Витебский государственный технологический университет»

ИНОСТРАННЫЙ ЯЗЫК (АНГЛИЙСКИЙ)

Рабочая тетрадь для практических работ
для студентов специальности
1-54 01 01 «Метрология, стандартизация и сертификация»

Витебск
2023

УДК 811.111

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Рекомендовано к изданию редакционно-издательским советом УО «ВГТУ», протокол № 4 от 30.12.2022.

Иностранный язык (английский) : рабочая тетрадь для практических работ / сост. О. В. Измайлович. – Витебск : УО «ВГТУ», 2023. – 58 с.

Рабочая тетрадь для практических работ для студентов специальности 1-54 01 01 «Метрология, стандартизация и сертификация» позволяет проводить проверку усвоения материала, осуществлять контроль мыслительной деятельности студентов и в системе осуществлять проверку знаний студентов, полученных в ходе учебных занятий и самостоятельной работы. Рабочая тетрадь может быть предложена студентам и всем желающим изучать английский язык с целью развития и совершенствования иноязычной профессиональной письменной компетентности по профессионально ориентированной тематике.

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Unit 1. Measurement Systems

Vocabulary Notes

Read and translate metric units of length.

A. The *meter* (m) is the basic unit of length or distance in the metric system.

The door of your classroom is about 1 meter wide.

B. Three metric units used to measure smaller lengths or distances are the *millimeter* (mm), the *centimeter* (cm), the *decimeter* (dm).

A paper clip is about 3 cm long and 1 cm wide.

It is made of wire about 1 mm thick.

A paperback book is about 1 dm wide.

C. The *kilometer* (km) is the metric unit that is usually used to measure larger lengths or distances. Sometimes, the *dekameter* (dam) and *hecto-* (hm) are used.

$1 \text{ km} = 10 \text{ hm} = 100 \text{ dam} = 1,000 \text{ m}$

Mt. McKinley is about 6 km high.

A three-story building is about 1 dam high.

The distance around a baseball diamond is about 1 hm.

D. Each of the prefixes for metric units has a meaning.

kilo	hecto	deka	deci	centi	milli
thousand	hundred	ten	tenth	hundredth	thousandth
1,000 m	100 m	10 m	0.1 m	0.01 m	0.001 m

Write some lengths or distances you would measure using:

1) meters; 2) millimeters; 3) centimeters; 4) kilometers.

- _____
- _____
- _____
- _____

Exercises

1. Use m, mm, cm, dm, or km to complete.

- The height of a room is about 3 _____.
- The length of a sofa is about 20 _____.
- The width of this book is about 20 _____.
- The width of a sharp pencil point is about 2 _____.
- The distance from Chicago to Dallas is about 1,500 _____.

2. Match. Select the answer that seems reasonable.

- | | |
|---|---------------------|
| 1) length of a football field; | a) \approx 2 m; |
| 2) thickness of a quarter (монета США); | b) \approx 1 km; |
| 3) length of a pencil; | c) \approx 100 m; |
| 4) width of a chair; | d) \approx 2 mm; |
| 5) height of a basketball player; | e) \approx 4 dm; |
| 6) distance you can walk in 10 minutes; | f) \approx 15 cm. |

1.	2.	3.	4.	5.	6.
----	----	----	----	----	----

3. Check the meaning of the unknown words in the dictionary.

Dimension –	Ounce –
Capacity –	Calipers –
Liquid –	Expansion –
Ground up solids –	Contraction –
Flour –	Scale –
Gravel –	Balances –

4. Read the text to find out what measuring devices exist.

A Measuring Device

A measuring device is a mechanism designed to find the dimensions, capacity or amount of something. Measuring devices can be divided into groups in several ways. For example, they can be divided according to the nature of things they are designed to measure; or they can be divided according to the type of measuring unit each device uses, or in any number of other ways.

If they are grouped according to the nature of the things they are designed to measure, we might have some devices for measuring liquids, some for measuring ground-up solids (such as flour, gravel, chemicals in powdered form etc.) and some for measuring requiring linear measurement (such as measurement for dimensions). Many other possible types of things and their devices could be included: the three are mentioned only as a sampler.

If we group measuring devices according to the type of measuring unit each uses, we might have the following types: linear units (feet, centimeters, inches, miles, metres, etc), weight units (grams, ounces, pounds etc.) and the units used for more specialized things, such as electric current and temperature (amps, degrees centigrade etc.).

Some examples of devices that use different types of measuring units are rulers, calipers and measuring tapes – all of which measure linear dimensions: balances – the most common being spring and beam balances – for measuring weight; and

6. Say if the following statements are true (T) or false (F) according to the information in the text.

1. Measuring devices can be divided into several groups according to the nature of things they are designed to measure or to the type of measuring unit each device uses.	
2. If we group measuring devices according to the nature of the things they are designed to measure we might have devices for measuring liquids and ground-up solids only.	
3. Having grouped measuring devices according to the type of measuring units each uses we may have linear units, volumetric units, weight units and others.	
4. Measuring cups and measuring spoons found in kitchens are used for measuring weight, while balances are used for measuring volume.	
5. Typical household thermometers are those containing either alcohol or mercury.	
6. Thermometers measure temperature the same way a ruler measures linear dimensions.	

7. Choose the right continuation to the sentences.

✓ Measuring devices _____.

✓ Some examples of devices that use different types of _____.

✓ A measuring device _____.

✓ A common example of a measuring device used to measure temperature _____.

✓ Typical household thermometers are _____.

✓ A thermometer _____.

✓ The ruler _____.

Word combinations to be inserted:

✓ measures directly;

✓ can be divided according to the nature of things they are designed to measure;

✓ are rulers, callipers and measuring tapes;

✓ those containing either alcohol or mercury;

✓ actually measures the expansion or contraction of the liquid inside it;

✓ is a thermometer;

✓ is a mechanism designed to find the dimensions capacity, amount of something.

8. Look through the text again. Choose one of the options to the meaning of the underlined words.

1. A measuring device is a mechanism designed **to find out** the dimensions, capacity or amount of something.

- a) to set up; b) to establish; c) to install; d) to determine.

2. Measuring devices can be divided according to the **nature** of the things they are designed to measure.

- a) origin; b) character; c) birth; d) type.

3. A common example of a measuring **instrument** used to measure more specified things is a thermometer.

- a) arrangement; b) mechanism; c) construction; d) device.

4. A **common** example of a measuring instrument is a ruler.

- a) typical; b) general; c) original; d) actual.

5. **Household** thermometers are those containing either alcohol or mercury.

- a) economical; b) family; c) standard; d) ordinary.

9. There is a mistake in each of the sentences. Find and correct it.

1. A measuring device are a mechanism designed to find the dimensions, capacity or amount of something.

2. Measuring devices are divided on groups in several ways.

3. A common example of a measuring instruments used to measure length is a ruler.

4. This instruments measure weight.

5. Typical household thermometers are that containing alcohol or mercury.

6. We may have some devices for measure volume.

Grammar Revision

1. Complete the table with more examples.

1) + -s	item – items	
2) + -es	hero – heroes	
3) singular = plural	deer	
4) -f(e) → -ves	leaf – leaves	
5) -s (uncountable, no plural)	statistics	
6) plural only (no singular)	surroundings	
7) uncountable, can be made countable with 'piece', 'item' or 'pair'	news – a piece of news	
8) plural without -s after a number	hundred (ten hundred)	
9) noun in -s: singular = plural	crossroads	
10) other irregular plurals	phenomenon – phenomena	

2. Write the following nouns in the plural in the appropriate columns.

Luggage, motto, clothes, child, information, tomato, piano, hero, homework, bison, point, trousers, fish, half, photo, potato, man, scissors, progress, boundary, woman, volunteer, mouse.

-s	-es	Irregular plural form	Only singular	Only plural
			<i>Luggage</i> ,	

3. Find pairs of nouns (countable – uncountable) with similar meanings.

Job, work, traffic, loaf, settee, cutlery, suitcase, skill, stuff, information, trip, bread, thing, tip, accommodation, advice, banknote, furniture, luggage, money, fact, car, knowledge, hotel, knife, travel.

Job (countable) – work (uncountable), _____

4. Do the PLURALS word puzzle.

1) woman – women, man – ...; 2) this word ends in -s, but is always singular; 3) medium – ...; 4) a time of great difficulty or danger; only one-letter difference from the singular form; 5) ends in -s; the same in the singular and the plural; 6) one of the two possible plural forms of the word 'cactus'; 7) a series of small bones in the backbone.

1.	M	E	N						
2.									
3.									
4.									
5.									
6.									
7.									

Words for reference: men, vertebrae, media, news, cactuses, species, crises.

5. Put in prepositions and translate the sentences.

of to on in on in in in

1. Many high technological industries rely _____ metrology to translate theoretical science into mass produced reality.
2. With the exception _____ few examples, all units of measurements are invented and agreed by people. _____ other words, units of measurement are quite arbitrary.
3. In past, communities didn't have any common benchmarks, which often resulted _____ confusion, inaccuracy and fraud.
4. Today, units of measurement are generally defined _____ a scientific basis.
5. Modern measurements are defined _____ relationship _____ internationally-standardized reference objects.
6. Many units of measure are defined terms _____ unique artifacts.



Reading

Read the passage below carefully. Translate it into Russian in a written form.

The micrometer

A micrometer is an instrument which is used for measuring small distances precisely. It can measure with a precision of 0.01 mm. A micrometer consists of a steel frame in the shape of a semi-circle. Attached to one end of this semi-circular frame is a small anvil. The other end of the frame extends outwards. A piece of metal in the shape of a cylinder fits on this extension. The cylindrical part is called the barrel or sleeve. Inside the barrel is a screw-thread.

Connected to the spindle is another cylindrical piece of metal called the thimble which fits over the barrel. Attached to the end of the thimble is a ratchet, which turns the spindle. Most micrometers have a lock knot, or locking ring, so that the spindle can be locked in any position. Measurements are taken between the anvil and the end of the spindle. They are read off from numbers which are marked on the barrel and on the spindle.

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Unit 2. Metric System

Vocabulary Notes

Read and remember the following words and word combinations:

candle *n*

- 1) свеча. *He lit a candle.*
- 2) международная свеча (единица измерения). *Candle (cd) is one of the basic units of the metric system.*

capacity *n*

- 1) объем, вместимость, емкость. *The seating capacity of the hall is 20.*
- 2) способность. *The students have the capacity to develop the new computer program.*
- 3) мощность, производительность; нагрузка. *The installed peak capacity of the boiler is high.*

coherent *adj*

- 1) связный, согласованный. *This book lacks any coherent structure.*
- 2) понятный, ясный; последовательный. *He proposed the coherent plan to improve the quality of production.*

complicated *adj*

запутанный, сложный. *The instructions were very complicated.*

conception *n*

понимание; концепция; замысел. *Men have no conception of what women really want.*

conversion *n*

превращение; изменение. *Chemical engineering deals with the conversion of raw materials into usable commodities.*

density *n*

густота, плотность; удельный вес. *These instruments are used for measuring the density of the atmosphere.*

to determine *v*

определять, устанавливать. *The quality determines the demand for the product.*

dimension *n*

измерение; *pl* размеры, величина, объем. *Every designer needs to know the exact dimensions of the room.*

embodiment *n*

воплощение; материализация. *Mother Theresa was an embodiment of kindness.*

to ensure *v*

обеспечивать, страховать; гарантировать. *The representative of the airline took steps to ensure the safety of the passengers.*

equal *adj*

равный, одинаковый. *The professor gave equal attention to every student.*

to equal *v*

равняться; уравнивать. *In the sum "x" equals 3.*

to establish *v*

устанавливать; основывать. *The university was established in 1968.*

fixed *adj*

неподвижный, постоянный; стационарный; неизменный. *The results of the experiment were fixed.*

frequently *adj*

часто, регулярно. *You can find the list of frequently asked questions on our website.*

illogical *adj*

нелогичный. *It is illogical to think that things will change on their own.*



1. Read the following statements and translate them into Russian.

To light a candle _____ ;

to blow out a candle _____ ;

a productive capacity _____ ;

to have a capacity of 5 litres _____ ;

peak capacity _____ ;

coherent rocks _____ ;

coherent thought _____ ;

coherent system of units _____ ;

complicated mechanism _____ ;

clear conception _____ ;

air density _____ ;

to determine the meaning of a word _____ ;

_____ ;

linear dimensions _____ ;

to ensure an income _____ ;

equal parts _____ ;

to equal smb's record _____ ;

to establish an international organization _____ ;

_____ ;

fixed prices _____ ;

illogical deduction _____ ;

2. Make different types of questions to the following sentences.

1. Candle (cd) is one of the basic units of the metric system.

2. The professor gave equal attention to every student.

3. The instructions were very complicated.

3. Make up 10 sentences with the words and word combinations from Vocabulary Notes.

① _____

② _____

③ _____

④ _____

⑤ _____

⑥ _____

⑦ _____

⑧ _____

⑨ _____

⑩ _____

4. Read the text.

Metric System and Its Origin

Metric system, international decimal system of weights and measures, is based on the metre for length and the kilogram for mass. The idea of a universal system of measures and weights dates from long ago, but it was realized only two centuries ago. The metric or decimal system was worked out by the French Academy of Sciences in 1791 and was adopted in France in 1795 and, by the late 20th century, was used officially in almost all nations.

The French Revolution of 1789 provided the opportunity to pursue the frequently discussed idea of replacing the confusing welter of traditional but illogical units of measure with a rational system based on multiples of 10. In 1791 the French National Assembly directed the French Academy of Sciences to address the chaotic state of French weights and measures. It was decided that the new system would be based on a natural physical unit to ensure immutability. How were the units for length and weight defined then? Two French scientists who were given the task to define these units, took one fourth of the distance from the North Pole to the Equator on the geographical meridian which is running through Paris (the distance from Dunkirk in France to Barcelona in Spain) and divided it into ten million equal parts. One of these parts was called a metre or “measure”. The academy settled on the length of 1/10,000,000 of a quadrant of a great circle of the Earth, measured around the poles of the meridian passing through Paris. An arduous six-year survey to determine the arc of the meridian from Barcelona, Spain, to Dunkirk, France, eventually yielded a value of 39.37008 inches for the new unit to be called the metre, from Greek “metron”, meaning “measure”.

All other metric units were derived from the metre, including the gram for

weight (one cubic centimetre of water at its maximum density) and the litre for capacity (one-thousandth of a cubic metre). Greek prefixes were established for multiples of 10, ranging from pico- (one-trillionth) to tera- (one trillion) and including the more familiar micro- (one-millionth), milli- (one-thousandth), centi- (one-hundredth), and kilo- (one thousand). Thus, a kilogram equals 1000 grams, a millimetre – 1/1000 of a metre. In 1799 “the Metre and Kilogram of the Archives”, platinum embodiments of the new units, were declared the legal standards for all measurements in France, but the motto of the metric system expressed the hope that the new units would be “for all people, for all time”.

Not until 1875 did an international conference meet in Paris to establish an International Bureau of Weights and Measures. The Treaty of the Metre signed there provided for a permanent laboratory in Sevres, near Paris, where international standards are kept, national standard copies inspected, and metrological research conducted. The General Conference of Weights and Measures, with diplomatic representatives of some 40 countries meets every six years to consider reform. The conference selects 18 scientists who form the International Committee of Weights and Measures that governs the Bureau.

For a time, the international prototype metre and kilogram were based, for convenience, upon the archive standards rather than directly upon actual measurement of the Earth. Definition by natural constants was readopted in 1960, when the metre was redefined as 1,650,763.73 wavelengths of the orange-red line in the krypton-86 spectrum, and again in 1983, when it was redefined as the distance travelled by light in a vacuum in 1/299,792,458 second. The kilogram is still defined as the mass of the international prototype at Sevres.

In the 20th century the metric system generated derived systems needed in science and technology to express physical properties more complicated than simple length, weight, and volume. The centimetre-gram-second (CGS) and the metre-kilogram-second (MKS) systems were the chief systems so used until the establishment of the International System of Units.

Russian scientists played a great part in the spreading of the metric system in Russia as well as in other countries. As far as in 1867 D.I. Mendeleev addressed Russian scientists to help to spread the decimal system. The project of the law about the use of the metric system in Russia was also worked out by D.I. Mendeleev.

It should be said, however, that up till the end of the 19th century different units of measurement were used in various countries. In our country the metric system was adopted in 1918, soon after the Great October Socialist Revolution. Now it is adopted by most of the countries. None of the systems of the past can be compared in simplicity to that of our days.

5. Translate the underlined sentences into Russian.

1. _____

2.

3.

4.

5.

6. Find in the text the following statements and make sentences with them.

Metric system _____

The frequently discussed idea _____

The confusing welter _____

Six-year survey _____


A cubic metre _____


A permanent laboratory _____


Diplomatic representatives _____


The international prototype _____


7. Write questions to the following sentences.

 Metric system is based on the metre for length and the kilogram for mass.
(*Disjunctive*)

 The idea of a universal system of measures and weights dates from long ago.
(*Special*)

 The metric system was worked out by the French Academy of Sciences in 1791. (*Alternative*)

 A kilogram equals 1000 grams. (*General*)

 D.I. Mendeleev played a great part in the spreading of the metric system in Russia. (*Special*)

 Till the end of the 19th century different units of measurement were used in

various countries. (*Special*)

None of the systems of the past can be compared in simplicity to that of our days. (*Disjunctive*)

Grammar Revision

1. Complete the following using an appropriate form of the adjectives.

1. The Trans-Siberian railway is _____ (*long*) in the world.
2. The twenty-second of December is the _____ (*short*) day of the year.
3. Iron is _____ (*useful*) of all metals.
4. The Neva is _____ (*wide*) and _____ (*deep*) than the Moskva River.
5. Elbrus is the _____ (*high*) peak in the Caucasian mountains.
6. His plan is _____ (*practical*) than yours.
7. His plan is _____ (*practical*) of all.
8. This room is _____ (*small*) than all the rooms in the house.
9. London is the _____ (*large*) city in England.
10. Silver is _____ (*heavy*) than copper.
11. Our house is _____ (*low*) than yours.
12. This exercise is _____ (*good*) than the last one.
13. Yesterday was _____ (*hot*) day we have had this summer.
14. The Battle of Stalingrad was the _____ (*great*) battle of all times.

2. Choose the right adverb (degree of comparison) to complete the sentences.

1. Alisa smiles even _____ (*most brightly / more brightly*) than the sun.
2. The new teacher explains the rules _____ (*more completely / completely*) than our book.
3. Jack arrived _____ (*latest / most late*) at the airport.
4. Jillian usually climbs _____ (*highest / higher*) of all the other climbers in her group.
5. Andrew is speaking even _____ (*more louder / louder*) than usual.
6. Melody dances _____ (*most gracefully / more gracefully*) of all the girls.
7. Of all three, Mike runs _____

(*fastest / faster*). 8. Of all two, Mike runs _____ (*fastest / faster*). 9. Harry swims _____ (*slower / slowest*) of all the boys in the swimming team. 10. Yesterday the President spoke _____ (*more calmly / calmly*) to Congress than usual.

3. Put the adverbs in brackets in the correct place in the sentences. Write the sentences.

1. I have a salad for lunch. (*usually*) _____

2. John is rude to his parents. (*never*) _____

3. Mary watches horror films. (*sometimes*) _____

4. They go abroad for their holidays. (*often*) _____

5. We drink strong coffee. (*hardly ever*) _____

6. I am impressed by music. (*rarely*) _____

7. She will remember this accident. (*always*) _____

8. The patient is sleeping after the operation. (*probably*) _____

9. The week is over. (*finally*) _____

10. I go to the gym twice a week. (*generally*) _____

4. Translate the following sentences into English.

1. В XVI веке Испания была самой могущественной державой мира.

2. Волга длиннее Днепра, это самая длинная река в Европе.

3. Ватикан – самое маленькое государство в Европе.

4. Это самый короткий путь.

5. Этот путь короче.

6. Нам нужен шкаф поменьше, потому что комната маленькая.

7. Мария – наша самая старшая сестра.

8. Это самая короткая дорога до моря.

9. Эта квартира светлее, чем квартира на первом этаже.

10. Математика была для нас самым трудным предметом в школе.



1. Read the text below carefully and translate it into Russian. Write the translation from the paragraph “*Mendeleev obtained a lot of awards from different scientific organizations ...*”

Dmitri Mendeleev

Dmitri Ivanovich Mendeleev was born on 8 February 1834 near Tobolsk. He was a Russian inventor and chemist. The most famous invention of Mendeleev is the periodic table of elements.

Mendeleev's parents were Maria Mendeleeva and Ivan Mendeleev. According to the different sources there were approximately seventeen children in their family. Mendeleev was the youngest child. His father worked as a teacher but he became blind and stopped working. As a result Maria Mendeleeva began to work and re-established the glass factory which belonged to her family. It is also known that Mendeleev's grandfather was a priest of the Russian Orthodox Church. When Mendeleev was 13 he entered the Gymnasium in Tobolsk.

In 1849 his family moved to Saint-Petersburg. In 1850 Mendeleev joined the Main Pedagogical Institute. Following the graduation he developed tuberculosis and was forced to relocate to the Crimean Peninsula. Living there, Mendeleev became a science master of the Simferopol gymnasium. In 1857 after recovery he arrived in Saint-Petersburg.

From 1859 to 1861 Mendeleev worked in Heidelberg and researched *the capillarity of liquids*. In April 1862 he married Feozva Nikitichna Leshcheva. Two years later Mendeleev became a professor at Saint-Petersburg Technological Institute. In 1865 he became a professor at Saint-Petersburg State University. The same year Mendeleev completed his dissertation “On the Combinations of Water with Alcohol”. By 1871 Saint-Petersburg was known as a center for chemistry research. In 1876 Mendeleev fell in love with Anna Ivanova Popova. In 1881 he made a proposal of marriage to her. The following year Mendeleev divorced his first wife. The same year he married Anna Popova. Mendeleev had two children from his first marriage: Olga and Vladimir. His other children from the second marriage were Lyubov, a pair of twins, and son Ivan. It should be noted that Lyubov was the wife of the Russian poet Alexander Blok.

Mendeleev obtained a lot of *awards* from different scientific organizations but he resigned from Saint-Petersburg University in 1890. Three years later Mendeleev was appointed Director of the Bureau of Weights and Measures. His task was to formulate new standards of vodka. According to the new standards created by Mendeleev all vodka had to be made at forty percent alcohol by volume. He also researched the composition of petroleum and made a *contribution* to the foundation of the first Russian *oil refinery*.

2. Read the sentences below. Check (☑) true (T) or (☒) false (F).

- | | T | F |
|---|--------------------------|--------------------------|
| 1. The most famous invention of Mendeleev is the periodic table of elements. | <input type="checkbox"/> | <input type="checkbox"/> |
| 2. Unit is a quantity adopted as a standard of measurement. | <input type="checkbox"/> | <input type="checkbox"/> |
| 3. There were approximately seventeen children in their family. | <input type="checkbox"/> | <input type="checkbox"/> |
| 4. His father became blind and stopped working. | <input type="checkbox"/> | <input type="checkbox"/> |
| 5. Practically there are three main systems of measurement in use today. | <input type="checkbox"/> | <input type="checkbox"/> |
| 6. Mendeleev became a science master of the Simferopol gymnasium. | <input type="checkbox"/> | <input type="checkbox"/> |
| 7. In 1865 he became a professor at Saint-Petersburg State University. | <input type="checkbox"/> | <input type="checkbox"/> |
| 8. Mendeleev obtained a lot of awards from different scientific organizations but he resigned from Saint-Petersburg University in 1890. | <input type="checkbox"/> | <input type="checkbox"/> |
| 9. The second is a unit for measuring time in all the system. | <input type="checkbox"/> | <input type="checkbox"/> |
| 10. According to the new standards created by Mendeleev all vodka had to be made at forty percent alcohol by volume. | <input type="checkbox"/> | <input type="checkbox"/> |

Unit 3. Units of Measurement

Vocabulary Notes

Read and remember the following words and word combinations:

measure *n*

- 1) мера; масштаб. *Parents love their children beyond measure.*
- 2) матем. делитель. *The greatest common measure is 7.*

to measure *v*

измерять, мерить. *Did you measure the windows before buying the curtains?*

measurement *n*

- 1) измерение (действие). *These measurements were done with the help of up-to-date devices.*
- 2) размер. *The measurements of the ground are 100 by 50 feet.*
- 3) система мер. *The metric system of measurements was used officially in almost all nations.*

metric system

метрическая система. *Metric system is based on the metre for length and the kilogram for mass.*

observation *n*

- 1) наблюдение. *During the experiment we recorded our observations in the notebooks.*
- 2) наблюдательность. *Ann has good powers of observation.*

property *n*

- 1) имущество; собственность; хозяйство. *They paid him the value of his lost property.*
- 2) свойство. *A chemical property of iron is its ability to react with other compounds.*

quantity *n*

количество; величина; размер. *Huge quantity of oil was spilling into the sea.*

research *n*

(обычно *pl*) (научное) исследование. *The results are consistent with earlier research.*

to research *v*

заниматься исследованиями. *An important problem has been successfully researched.*

science *n*

наука. *This idea is discredited by modern science.*

scientist *n*

ученый; натуралист, естествоиспытатель. *My father is a scientist studying the machinery.*

simplicity *n*

простота; простодушие. *Simplicity is the key to an efficient design.*

unit *n*

единица; единица измерения. *The metric unit of energy is the "joule".*

velocity *n*

скорость; быстрота. *The velocity of light is a constant.*



1. Read the following statements and translate them into Russian.

- Metric unit of energy _____ ;
- to measure land _____ ;
- to take smb's measurements _____ ;
- the metric system of measurements _____ ;
- record of observation, private property _____ ;
- considerable quantity _____ ;
- advanced research _____ ;
- the methods of science _____ ;
- qualified scientist _____ ;
- the velocity of light _____ .

2. Make different types of questions to the following sentences.

1. The metric system of measurements was used officially in almost all nations.

2. An important problem has been successfully researched.

3. The velocity of light is a constant.

3. Make up 10 sentences with the words and word combinations from Vocabulary Notes.

① _____

② _____

③ _____

④ _____

⑤ _____

⑥ _____

⑦ _____

⑧ _____

⑨ _____

⑩ _____

4. Read the text.

Units of Measurement

Real science has various recognized steps. It always begins with observation followed by classification and measurement. Classification has become the first step

towards understanding of a new phenomenon. Phenomena have to be put in some order before anything can be done with them. Measurement is one further step in the process of putting them in order. It is only by measurement that new knowledge enters science.

Unit is a quantity or dimension adopted as a standard measurement. Much of physics deals with measurements of physical quantities such as length, time, velocity, area, volume, mass, density, temperature, and energy. Many of these quantities are interrelated. For example, density is mass divided by volume. Most of the physical quantities are related to length, time, and mass. Therefore all the systems of physical units are derived from these three fundamental units.

Practically there are three main systems of measurement in use today: the British system of units, the metric system of units and the System of International Units (SIU). With a few exceptions nearly all the nations of the world use the metric system. The value of the MKS (metre-kilogram-second) system is that its various units possess simple and logical relationships among themselves, while the British system (the f. p. s. – foot-pound-second) is a very complicated one. For example, in the British system 1 mile is equal to 1760 yards; 1 yard is equal to 3 feet, and 1 foot is equal to 12 inches. In the English system converting one unit into another is a hard and monotonous job, while in the MKS system conversions of one unit to another can be carried out by shifts of a decimal point (comma in Russian writing).

The standard metre of the world was originally defined in terms of the distance from the North Pole to the equator. This distance is close to 10,000 kilometres or 10^7 metres.

In fact, the SIU is an internationally agreed coherent system of units derived from the MKS system. The seven basic units in it are: the metre (m), kilogram (kg), second (sec), ampere (A), Kelvin (K), mole (mol), and candle (cd).

5. Find in the text and write the answers to the following questions.

1. What are the recognized steps in real science?

2. Why are classification and measurement so important in real science?

3. What is unit?

4. What are the three fundamental units?

5. What systems of measurement are widely in use all over the world?

6. Why is the metre system widely in use all over the world?

7. What are the units of length in the British system?

8. How was the metre originally defined?

9. What standard unit is used for measuring area?

6. Find in the text English equivalents to the following words and word combinations.

Признанные этапы _____ ;

в процессе упорядочения _____ ;

истинная наука _____ ;

эти свойства взаимосвязаны _____ ;

масса, деленная на объем _____ ;

выводится из _____ ;

на основании расстояния _____ ;

плотность _____ ;

система измерения _____ ;

за небольшим исключением _____ ;

ценность метрической системы _____ ;

десять в седьмой степени _____ .

7. Complete the following sentences using the information from the text.

1. Real science always begins with observation followed by _____ and _____.
2. It is only by measurement that new knowledge _____ science.
3. Most of the physical quantities are related to _____, _____ and _____.
4. Therefore all the systems of physical units are derived from these _____ fundamental units.
5. There are three main systems of _____ in use today.
6. The seven basic units in it are: _____, _____, _____, _____, _____, _____, and _____.

Grammar Revision

1. Complete the sentences using the correct form of the pronouns.

1. He patted Jack heartily on _____ (*he*) shoulder.
2. He put _____ (*he*) hand into _____ (*he*) pocket.
3. _____ (*They*) say there's been a great earthquake in the Pacific.
4. Don't show this letter to _____ (*you*) brother.
5. She folded the letter and replaced it in _____ (*it*) envelope.
6. This demand of _____ (*they*) is quite ridiculous.
7. She makes all _____ (*she*) clothes herself.
8. There was a cold wind blowing so I put on _____ (*I*) heavy coat.

2. Complete the sentences using reflexive pronouns.

1. The chairman announced the news _____.
2. I never do anything until I have checked everything _____.
3. She says John broke the vase, but really she did it _____.
4. Next year we'll live all by _____.
5. Did the boys build this boat _____?
6. We built most of the house _____.
7. The girl stood by the fire, warming _____.
8. He made a mistake and then he corrected _____.
9. There can be no doubt that Shakespeare _____ wrote this play.
10. Pat, put it down in front of _____.
11. I hope you didn't hurt _____.

3. Complete the sentences using the correct variant of the pronouns.

1. You can find him _____ (*some / any / no*) time between six and nine. 2. Is there _____ (*any / no*) other choice? 3. He can answer _____ (*some / any / no*) question on the subject. 4. I can answer now only _____ (*some / any / no*) questions on the subject. 5. She has a perfect complexion and _____ (*some / any*) colour becomes her. 6. Can we have _____ (*any / some*) milk? 7. Is _____ (*any / some*) additional proof necessary? 8. Will you have _____ (*any / no / some*) more tea? – Thank you. 9. What material do you need? – _____ (*Some / Any*) that is available. 10. Don't bother about the colour. You can buy her a blouse of _____ (*any / some*) colour. 11. If you have _____ (*any / some / no*) news, call me back. 12. They understood each other without _____ (*no / some / any*) words.

4. Fill in the gaps with one of the following pronouns: *much, many, (a) little, (a) few*.

1. Last week there was so _____ rain that I was not able to go out. 2. We have not made very _____ progress recently. 3. My dear, I'm afraid I have not _____ news to convey but still there are _____ things I should like to add. 4. The forces were unequal, they were _____, we were _____. 5. My engagements were _____ and I was glad to accept the invitation. 6. He was so happily absorbed in the building of his house that events outside it affected him _____. 7. He has very _____ knowledge of the matter. 8. There isn't _____ harm in it. 9. _____ was said but _____ done. 10. I suggested that he should get _____ plums and some bread. 11. I have so _____ things to do that I don't know which to do first. 12. Aunt Florrie had _____ money while none of the other family had inherited as a pound. 13. My sister spends so _____ money on her clothes that she has none left for holidays. 14. Adeline had slept _____ last night and she had a headache.



1. Read the text below carefully and translate it into Russian.

Standards historically and currently

In the science of measurement, a standard is an object, system, or experiment that bears a defined relationship to a unit of measurement of a physical quantity. Standards are the fundamental reference for a system of weights and measures, against which all other measuring devices are compared.

With the exception of a few seemingly fundamental quantum constants, units of measurement are essentially arbitrary; in other words, people make them up and then agree to use them.

Nothing inherent in nature dictates that an inch has to be a certain length, or that a mile is a better measure of distance than a kilometer.

Over the course of human history, however, first for convenience and then for necessity, standards of measurement evolved so that communities could have certain common benchmarks. Laws regulating measurement were originally developed to prevent fraud in commerce.

Historical standards for length, volume, and mass were defined by many different authorities, which resulted in confusion and inaccuracy of measurements. Modern measurements are defined in relationship to internationally-standardized reference objects, which are used under carefully controlled laboratory conditions to

define the units of length, mass, electrical potential, and other physical quantities.

Today, units of measurement are generally defined on a scientific basis, overseen by governmental or supra-governmental agencies, and established in international treaties, pre-eminent of which is the General Conference on Weights and Measures (CGPM), established in 1875 by the Treaty of the meter and which oversees the International System of Units (SI) and which has custody of the International Prototype Kilogram.

Primary measurement standards may be used strictly in measurement laboratories. Less precisely controlled working standards are used for calibration of industrial measurement equipment. Primary standards that define units may be inconvenient for everyday use, so working standards represent the primary definition in a form that is easier to use. For example, the definition of the “metre” is based on a laboratory experiment combining the speed of light and the duration of a second, but a machine shop will have working standard gauge blocks that are used for checking its measuring instruments.

Initially many units of measure were defined in terms of unique artifacts which were the legal basis of units of measure. A continuing trend in metrology is to eliminate as many as possible of the artifact standards and instead define practical units of measure in terms of fundamental physical constants, as demonstrated by standardized technique.

Most basic units have already been redefined this way. The meter, for example, was redefined in 1983 by the CGPM as the distance traveled by light in free space in $1299,792,458$ of a second while in 1960 the international yard was defined by the governments of the United States, United Kingdom, Australia and South Africa as being exactly 0.9144 metres.

Another example is the unit of electrical potential, the volt. Formerly it was defined in terms of standard cell electrochemical batteries, which limited the stability and precision of the definition. Recently the volt has been defined in terms of the output of a Josephson junction, which bears a direct relationship to fundamental physical constants.

One advantage of elimination of artifact standards is that inter-comparison of artifacts is no longer required. Another advantage is that the system of measures won't be disrupted by the loss or damage of the artifact standards.

2. Find the answers to the following questions.

1. Why are units of measurements quite arbitrary?

2. What were standards originally established for?

3. How did people historically try to establish standards?

4. What is the main treaty in which modern standards are defined?

5. Why do modern metrologists try to eliminate unique artifacts? What are the advantages of this trend? What are the artifacts changed with? Give some examples.

6. What's the difference between primary and secondary standards? Which are more precise? Which are more convenient?

Unit 4. The Role of Standards

Vocabulary Notes

Read and translate the following words and word combinations:

- benefit (verb) _____;
- conform (verb) _____;
- conformity assessment _____;
- consumer (noun) _____;
- contribution (noun) _____;
- enormous (adjective) _____;
- interchangeability (noun) _____;
- legislation (noun) _____;
- purchaser (noun) _____;
- quality (noun) _____;
- repercussion (noun) _____;
- standard (noun) _____;
- to be unaware of smth. _____;
- to meet smb's expectations _____.

Exercises

1. Match the words with their definition.

1. Standard _____
2. Conformity assessment _____
3. Interchangeability _____
4. Quality _____
5. Legislation _____

Definitions:

- the quality of being capable of exchange or interchange;
- the law enacted by a legislative body or the act of making or enacting laws;
- a degree or grade of excellence or worth;
- any definite rule, principle or measure established by authority;
- any activity concerned with determining directly or indirectly that requirements are fulfilled.

2. Match the synonyms.

- 1) repercussions;
- 2) enormous;
- 3) to turn out;
- 4) to safeguard;
- 5) principal;
- 6) expectation;
- 7) unaware;
- 8) to conform;
- 9) to benefit;
- 10) efficient;

- a) to be of profit;
- b) effective;
- c) to fit in;
- d) hope;
- e) not known;
- f) to protect;
- g) main;
- h) to happen;
- i) results (effects);
- j) large.

3. Match the antonyms.

- 1) purchaser;
- 2) public;
- 3) to be of poor quality;
- 4) unreliable;
- 5) to be unaware;
- 6) positive;
- 7) enormous;
- 8) consumer;

- a) small;
- b) producer;
- c) to know;
- d) negative;
- e) to be of high quality;
- f) reliable;
- g) seller;
- h) private.

4. Complete the sentences using the words from Vocabulary Notes.

1. The company should strive _____ of its customers and continually improve the effectiveness of its _____ management system or to improve the _____ of its products.

2. If the management frequently accepts compromises it may have serious long-term _____.

3. _____ give specifications or requirements for products, services, systems, processes and are the key _____ to the development of the global market. Requirements for sale of pre-packed goods are the part of national _____ in many countries.

4. ISO standards make an _____ to society as a whole.

5. Read the text and fill in the blanks with the words given below.

to standards legislation repercussions of expectations

What if standards did not exist?

If there were no standards, we would soon notice. Standards make an enormous contribution to most aspects of our lives – although very often, that contribution is invisible. It is when there is an absence of standards that their importance is brought home. For example, as purchasers or users of products, we soon notice when they turn out to be of poor quality, do not fit, are incompatible with equipment we have already had, are unreliable or dangerous. When products meet our _____, we tend to take this for granted. We are usually unaware _____ the role played by standards in raising levels of quality, safety, reliability, efficiency and interchangeability – as well as in providing such benefits at an economical cost.

ISO (International Organization for Standardization) is the world's largest developer of standards. Although ISO's principal activity is the development of technical standards, ISO standards also have important economic and social _____. ISO _____ make a positive difference, not just to engineers and manufacturers for whom they solve basic problems in production and distribution, but to society as a whole.

The International Standards which ISO develops are very useful. They are useful to industrial and business organizations of all types, to governments and other regulatory bodies, to trade officials, to conformity assessment professionals, to suppliers and customers of products and services in both public and private sectors, and, ultimately, to people in general in their roles as consumers and end users.

ISO standards contribute to making the development, manufacturing and supply of products and services more efficient, safer and cleaner. They make trade between countries easier and fairer. They provide governments with a technical base for health, safety and environmental _____. They aid in transferring technology to developing countries. ISO standards also serve to safeguard consumers, and users in general, of products and services – as well as to make their lives simpler.

When things go well – for example, when systems, machinery and devices work well and safely – then often it is because they conform _____ standards. And the organization responsible for many thousands of the standards which benefit society worldwide is ISO.

6. Answer the questions.

1. Do standards make an enormous contribution to most aspects of our lives?

2. When do we notice the importance of standards?

3. What is ISO's principal activity?

4. Standards make trade between countries easier and fairer, don't they?

5. Why are standards useful to governments?

7. Decide whether the statements are true (T) or false (F).

1. The contribution of standards to society is invisible.	
2. Standards raise levels of quality, safety, reliability, efficiency.	
3. ISO is one of the world's largest developer of standards.	
4. ISO standards solve basic problems in production and distribution for engineers and manufactures.	
5. ISO standards facilitate trade between countries.	

8. Choose the best continuation to the following sentences from the text.

1. If there were no standards _____.

- a) we would take this for granted;
- b) we would soon notice;
- c) we wouldn't notice.

2. When products meet our expectations _____.

- a) we tend to take this for granted;
- b) we are usually unaware of it;
- c) we consider them to be of high quality.

3. ISO is _____.

- a) the world's largest developer of standards;
- b) the institute of International standards;
- c) the International organization of technical standards.

4. The International standards which ISO develops _____.

- a) are necessary only for industrial and business organizations of all types;
- b) are very useful to suppliers of products and services;
- c) are very useful.

5. When system and devices work well and safety, then it is because _____

- a) they are incompatible with standards;
b) they conform to standards;
c) they turn out to be of poor quality.

9. Underline the sentences that express the main idea of the text best of all.

1. ISO is the world's largest developer of technical standards.
2. ISO standards make our lives simpler.
3. We are usually unaware of the role played by standards in our lives.
4. Standards make an enormous contribution to most aspects of our lives.
5. ISO standards benefit society worldwide.

Grammar Revision

1. Complete the sentence with the correct form of the verb given in the brackets.

1. The Browns _____ (to come back) next week. 2. I often _____ (to listen) to the radio in the morning. 3. They _____ (to live) in Brest two years ago. 4. The students' canteen _____ (to be) very noisy and always full of hungry students.
5. A square _____ (to have) four equal parallel sides. 6. They usually _____ (to play) chess on Saturday. 7. I _____ (to like) to watch TV every evening. 8. I _____ (to go) to the exhibition next Sunday. 9. They _____ (to be) all technical students. 10. They _____ (to have) no English lessons yesterday.

2. Fill in the following words:

to boil, to close, to complete, to cost (2), to like, to meet, to open, to solve, to speak, to study, to teach, to understand, to wash.

1. Margaret _____ four languages. 2. In Britain the bank usually _____ at 9.30 in the morning. 3. The City Museum _____ at 5 o'clock in the evening. 4. Tina is a teacher. She _____ math to young children. 5. My job is very interesting. I _____ a lot of people. 6. Peter _____ his hair twice a week. 7. Food is expensive. It _____ a lot of money.

8. Shoes are expensive. They _____ a lot of money. 9. Water _____ at 100 degrees Celsius. 10. Julia and I are good friends. I _____ her and she _____ me. 11. Andrew _____ a new programme yesterday. 12. The students _____ a calculating machine at the laboratory class last month. 13. Julia _____ a complicated problem at the lesson of math yesterday. 14. All the students _____ the basic concepts in computers science.

3. Fill in the correct passive form of the verbs.

1. She _____ (to visit) by her parents every day. 2. English _____ (to speak) in many countries of the world. 3. Many new magazines _____ (to publish) in our republic. 4. The meetings _____ (to hold) usually here. 5. At the yesterday's meeting the best students _____ (to reward) with diploma. 6. Unfortunately, hundreds of rare animals _____ (to kill) every day. 7. The new school _____ (to situate) in the centre of the city. 8. The modern hostel _____ (to build) next year. 9. This theorem _____ (not to prove) yesterday. 10. The new petrol station _____ (to open) next week.

4. Translate the following sentences into English using Simple Tenses.

1. Мой друг хорошо разбирается в физике.

2. Игорь – студент-первокурсник.

3. В каждом блоке общежития есть ванная комната.

4. Наука и технологии играют важную роль в нашей жизни.

5. Он сказал, что поедет туда через неделю.

6. Ты часто сюда приходишь?

7. Олег работал над этой программой в прошлом году.

8. Завтра наш преподаватель будет читать лекцию на английском языке.

9. Лекция записана карандашом.

10. Радио было изобретено А.С. Поповым.

11. Олимпийские игры проводятся каждые четыре года.

12. Моя курсовая работа будет проверена через неделю.

13. Наш багаж не был проверен на таможне.

14. Витебск был основан в 974 году.

15. Лекции этого преподавателя всегда слушают с большим вниманием.

16. Эти книги должны быть возвращены в библиотеку на следующей неделе.

17. Студенту велели объяснить, почему он пропустил занятие.



Read the text below carefully and translate it into Russian.

The main benefits of ISO standards

ISO was founded with the idea of answering a fundamental question: “What’s the best way of doing this?”

It started with the obvious things like weights and measures, and over the last 50 years has developed into a family of standards that cover everything from the shoes we stand in, to the Wi-Fi networks that connect us invisibly to each other.

Addressing all these and more, International Standards mean that consumers can have confidence that their products are safe, reliable and of good quality. ISO’s standards on road safety, toy safety and secure medical packaging are just a few of those that help make the world a safer place.

Regulators and governments count on ISO standards to help develop better regulation, knowing they have a sound basis thanks to the involvement of globally-established experts.

Certification can be a useful tool to add credibility, by demonstrating that your product or service meets the expectations of your customers. For some industries, certification is a legal or contractual requirement.

ISO does not perform certification. At ISO, we develop International Standards, such as ISO 9001 and ISO 14001, but we are not involved in their certification, and do not issue certificates. This is performed by external certification bodies, thus a company or organization cannot be certified by ISO.

However ISO's Committee on Conformity Assessment (CASCO) has produced a number of standards related to the certification process, which are used by certification bodies.

Unit 5. Measurement Standards

1. Match the terms and definitions.


	a) the science of measurement, including both experimental and theoretical determinations at any level of uncertainty in any field of science and technology.
	b) the property of the result of a measurement or the value of a standard whereby it can be related to stated national or international standards.
	c) a comparison between measurements.
	d) the process or the result of determining the ratio of a physical quantity, such as a length, time, temperature etc., of something, to an established unit, such as meter, second or degree Celsius.
	e) the degree of exactness which the final product corresponds to the measurement standard.
	f) the ability of a measurement to be consistently reproduced.

Terms: measurement; traceability; metrology; calibration; precision; accuracy.

2. Match the words with Russian equivalents.

- | | |
|---|--|
| <ul style="list-style-type: none"> 1) to compare; 2) opportunity; 3) bias; 4) experience; 5) equipment; 6) to require; 7) curriculum vitae; 8) to gauge; 9) alignment; 10) to contribute; 11) reliability; | <ul style="list-style-type: none"> a) оборудование; b) измерять, выверять, калибровать; c) сравнивать; d) надёжность; e) требовать; f) неточность, погрешность, ошибка; g) возможность; h) резюме; i) регулировка, подгонка, настройка; j) опыт; k) внести вклад. |
|---|--|

3. Match synonyms.

- | | |
|----------------------|------------------|
| 1) curriculum vitae; | a) demand (n); |
| 2) to concern; | b) to define; |
| 3) requirement; | c) to establish; |
| 4) regulatory; | d) resume; |
| 5) to set up; | e) to deal with; |
| 6) core (adj); | f) essential; |
| 7) to determine; | g) moderating; |
| 8) concept; | h) accuracy; |
| 9) precision; | i) equipment; |
| 10) uncertainty; | j) to vary; |
| 11) tool; | k) to measure; |
| 12) to gauge; | l) alignment; |
| 13) adjustment; | m) bias; |
| 14) experience; | n) background; |
| 15) to range; | o) notion. |
- 

4. Read the text below to find out how different kinds of standards can contribute to the measurement procedure.

The word “standard” is used with two different meanings: as a widely adopted specification, technical recommendation or similar document (in French, “norme”); and also as a measurement standard (in French, “etalon”). The qualifier “measurement” should therefore be used to avoid misunderstandings.

A measurement standard can be a physical measure, measuring instrument, reference material or measuring system intended to define, realize, conserve or reproduce a unit or one or more values of a quantity to serve as a reference.

There is a hierarchy of measurement standards.

International measurement standards

Standard recognized by an international agreement to serve internationally as the basis for assigning values to other standards of the quantity concerned.

The custodian of international measurement standards is the BIPM (International Bureau of Weights and Measures) in Sèvres near Paris. The oldest standard in use is the kilogram prototype.

National measurement standards

Standard recognized by national law to serve, in a country, as the basis for assigning values to other standards of the quantity concerned.

The custodian of national measurement standards is usually a national laboratory called the National Metrology Institute, National Bureau of Standards or National Bureau of Weights and Measures. Some countries do not have national measurement standards.

Primary standards

Standard that is designated or widely acknowledged as having the highest metrological qualities and whose value is accepted without reference to other standards of the same quantity.

Primary standards are, for example, Josephson devices for the realization of the quantity “volt,” or stabilized lasers with interferometers for the realization of the quantity “length”. These devices are used as national standards by many National Metrology Institutes and some of the best-equipped calibration laboratories.

Secondary standards

Standard whose value is assigned by comparison to a primary standard of the same quantity. Primary standards are usually used to calibrate secondary standards.

Working standards

Standard that is used routinely to calibrate or check material measures, measuring instruments, or reference materials.

A working standard is usually calibrated against a secondary standard. A working standard used routinely to ensure that measurements are being carried out correctly is called a “check standard”. There is no general requirement as far as the accuracy of standards is concerned. A working standard in one location may be good enough to serve as the reference standard or even as a national standard in another. The accuracy of some measuring instruments used in industry is so high that primary standards are necessary for calibration.

Reference standards

Standard generally having the highest metrological quality available at a given location or in a given organization, from which the measurements made at that location are derived.

Calibration laboratories maintain reference standards for calibrating their working standards.

Transfer standards

Standard used as an intermediary to compare standards.

Resistors are used as transfer standards for comparisons of voltage standards, weights are used to compare balances.

Travelling standard

Standard, sometimes of special construction, intended for transport between different locations, and used for inter-comparison of standards.

A portable battery-operated cesium frequency standard may be used as a travelling standard. Calibrated load cells are used as travelling force standards.



Exercises

1. Give detailed answers to the following questions.

1. What does the word “standard” mean?

2. What is a measurement standard?

3. What types of measurement standards do you know?

4. What is the custodian of international measurement standards?

5. How does an international measurement standard work?

6. Why don't any countries have national measurement standards?

7. What is the difference between primary and secondary standards?

8. What is a working standard used for?

9. Why is it called a “check standard”?

10. What do calibration laboratories maintain for calibrating their working standards?

11. What is used to compare standards?

12. What is the example of travelling force standards?

13. What are seven basic measurement units in the SI system?

2. Match the pairs of synonyms.

- | | |
|--------------------------|-----------------|
| 1) recommendation; | a) acknowledge; |
| 2) document; | b) dimension; |
| 3) recognize; | c) ascribe; |
| 4) agreement; | d) precision; |
| 5) derive; | e) gauge; |
| 6) assign; | f) advice; |
| 7) custodian; | g) the same; |
| 8) measuring instrument; | h) covenant; |
| 9) calibrate; | i) graduate; |
| 10) measurement; | j) paper; |
| 11) carry out; | k) guard; |
| 12) accuracy; | l) perform; |
| 13) similar; | m) obtain. |

3. Make up word combinations from two columns and give their Russian equivalents.

- | | |
|-------------------|-------------------|
| 1) measurement; | a) of a quantity; |
| 2) reference; | b) laboratory; |
| 3) measuring; | c) material; |
| 4) value; | d) agreement; |
| 5) international; | e) quality; |
| 6) national; | f) standard; |
| 7) metrological; | g) measure; |
| 8) calibration; | h) law; |
| 9) material; | i) instrument. |

4. Read the sentences, translate them into Russian and define the Infinitive functions.

1. Many early standards were based on the human body: the length of man's hand, the width of his thumb, the distance between outstretched fingertips, the length of one's foot, a certain number of paces, etc.

2. In the beginning, while groups were small, such standards were convenient and uniform enough to serve as the basis for measurements.

3. The logical person to impose a single standard was the ruler of the country – hence, our own 12-inch or other short measuring stick is still called a *ruler*.

4. We must make measurements, and we must know how accurately (or, to be more correct, with what uncertainty) we made those measurements. In order to know that, there must be standards.

5. The earliest standards were based on the human body, and then attempts were made to base them on “natural” phenomena.

6. Since the second is maintained by atomic clocks it is necessary to add “leap seconds” periodically so that the solar day does not gradually change with respect to the time used every day.

7. Protocol standards can be defined as documents describing the operations and processes that must be performed in order for a particular end to be achieved.

8. Standards of practice are called a “protocol” by Europeans to avoid confusion with a physical standard.

9. For example, buyers of fuel oil are charged by a unit of liquid volume. In the U.S., this would be the gallon; but in most other parts of the world, it would be the liter. It is important for the buyer that the quantity ordered is actually received and the refiner expects to be paid for the quantity shipped. Both parties are interested in

accurate measurements of the volume and, therefore, need to agree on the units, conditions, and method(s) of measurement to be used.

10. Persons needing to measure a mass cannot borrow the primary standard maintained in France or even the national standard from the National Institute of Standards and Technology (NIST) in the U.S. They must use lower-level standards that can be checked against those national or international standards.

11. Everyday measuring devices, such as scales and balances, can be checked (calibrated) against working level mass standards from time to time to verify their accuracy.

5. Expand the following ideas using information from the text.

1. There are two different meanings of the word “standard”.

2. A measurement standard is reference material.

3. There are eight main measurement standards.

4. Some countries don't have national measurement standards.

5. Primary standards have the highest metrological qualities.

6. A working standard is usually calibrated against a secondary one.

7. A working standard in one location may be good enough to serve as the reference standard or even as a national standard in another.



Grammar Revision

1. Complete the sentences with the correct tense form of verbs:

1. I _____ (to study) Japanese online from 5 till 6 tomorrow evening.
2. Listen! Why the dogs _____ (to bark)?
3. She _____ (to wear) a yellow coat when I saw her.
4. They _____ (to take) their driving test next Monday.
5. I dropped my wallet when I _____ (to get) on the bus.
6. What you _____ (to do) in my office yesterday?
7. Bob _____ (to feel) much better today.
8. The kids _____ (to watch) cartoons in their room now.
9. I'm afraid she _____ (to sleep) in ten minutes.
10. We _____ (to have) tea soon.
11. It sometimes _____ (snows / is snowing) here in April.
12. It _____ (snows / is snowing) now.
13. Every morning mother _____ (cooks / is cooking) breakfast for us.
14. It is 8 o'clock. Mother _____ (cooks / is cooking) breakfast.
15. Every day father _____

_____ (*leaves / is leaving*) the house at half past eight. 16. It is half past eight. Father _____ (*leaves / is leaving*) the house. 17. We often _____ (*watch / are watching*) TV. 18. Now we _____ (*sit / are sitting*) in armchairs and _____ (*watch / are watching*) TV. 19. Sometimes Mike _____ (*does / is doing*) his lessons in the evening. 20. Look at Mike. He _____ (*does / is doing*) his lessons. 21. It often _____ (*rains / is raining*) in September. 22. It _____ (*rains / is raining*) now. 23. Every day the family _____ (*have / are having*) tea at 5 o'clock. 24. It is 5 o'clock. The family _____ (*have / are having*) tea.

2. Translate the following sentences into English using Perfect Tense.

1. Ты показал друзьям свою работу? – Нет, она еще не готова.

2. Посмотри, он правильно написал формулу на доске.

3. Она только что вернулась из командировки.

4. Гости ушли до того, как я вернулся домой.

5. Том нервничал, потому что не подготовил домашнее задание.

6. Мы подготовимся к экзаменам к началу сессии.

7. Опыты были закончены к 5 часам.

8. Он уже закончил работу, когда я пришел к нему.

9. Ты уже видел этот фильм?

10. Я знаю его с 2010 года.



1. Read the text and write the answers to the questions after the text.

Careers in Metrology

What does a metrologist do? A metrologist is a scientist who develops processes and systems used to measure objects. This includes all physical characteristics, including length, weight, volume and radius as well as intangible characteristics such as time.

A metrologist develops and evaluates calibration systems that measure characteristics of objects, substances, or phenomena, such as length, mass, time, temperature, electric current, luminous intensity, and derived units of physical or chemical measure. He or she identifies magnitude of error sources contributing to uncertainty of results to determine reliability of measurement process in quantitative terms.

A metrologist redesigns or adjusts measurement capability to minimize errors. He or she develops calibration methods and techniques based on principles of measurement science, technical analysis of measurement problems, and accuracy and precision requirements. A specialist in metrology directs engineering, quality, and laboratory personnel in design, manufacture, evaluation, and calibration of measurement standards, instruments, and test systems to ensure selection of approved instrumentation. He or she advises others on methods of resolving measurement problems and exchanges information with other metrology personnel through participation in government and industrial standardization committees and professional societies.

What does a metrologist ... evaluate, develop, identify, determine, measure, redesign or adjust direct advice?

Example:

What does a metrologist do these things for?	A metrologist develops calibration systems to measure characteristics of objects and substances.
What does a metrologist do these things for?	

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Учебное издание

ИНОСТРАННЫЙ ЯЗЫК (АНГЛИЙСКИЙ)

Рабочая тетрадь для практических занятий

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Подписано к печати 12.01.2023. Формат 60x90^{1/16}. Усл. печ. листов 3,6.
Уч.-изд. листов 4,6. Тираж 30 экз. Заказ № 26.

Учреждение образования «Витебский государственный технологический университет»
210038, г. Витебск, Московский пр., 72.

Отпечатано на ризографе учреждения образования

«Витебский государственный технологический университет».

Свидетельство о государственной регистрации издателя, изготовителя,
распространителя печатных изданий № 1/172 от 12 февраля 2014 г.

Свидетельство о государственной регистрации издателя, изготовителя,
распространителя печатных изданий № 3/1497 от 30 мая 2017 г.