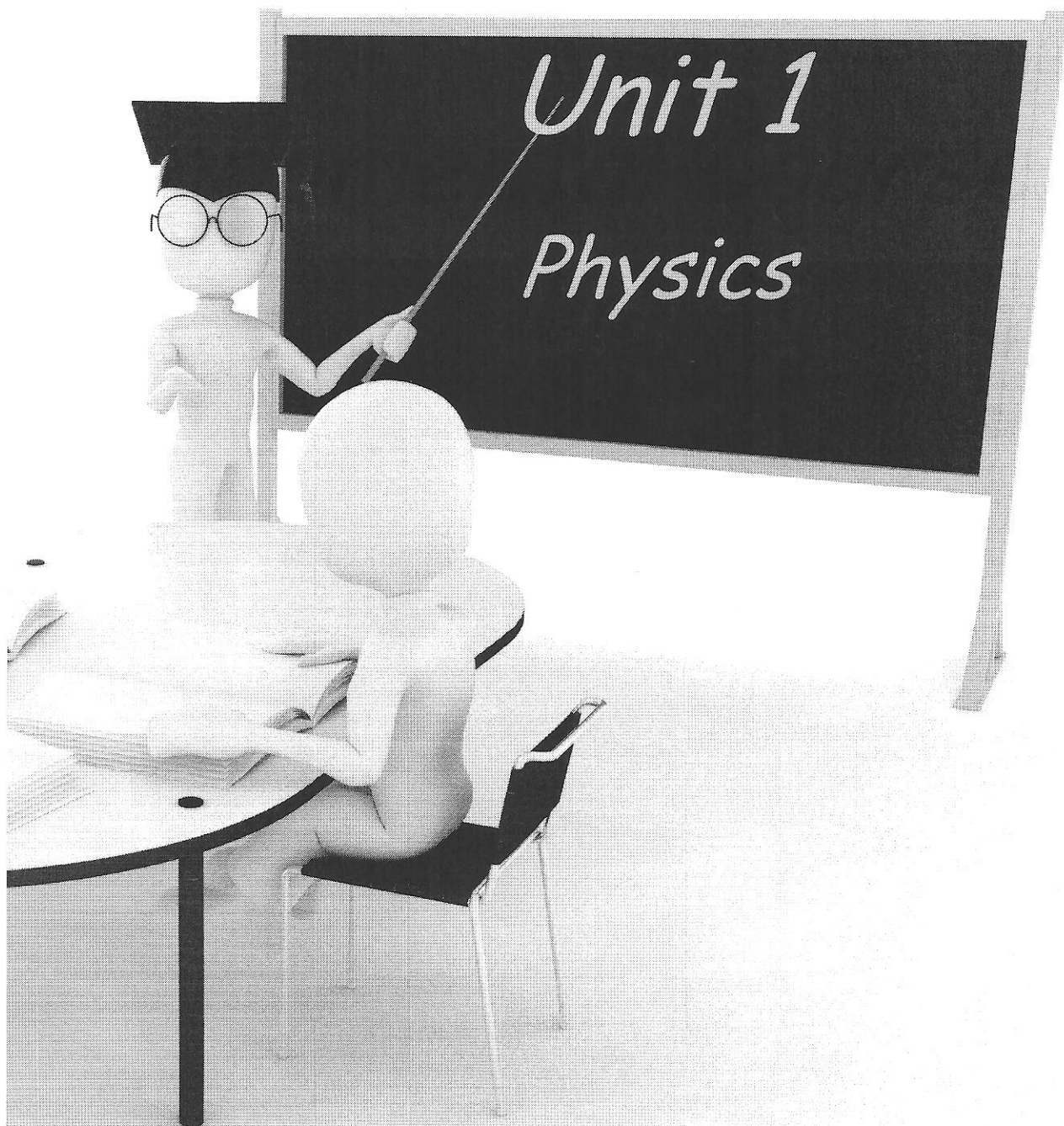



# *Fundamental Course*



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## Stage 1 – Vocabulary

## Physics

 <b>acoustics</b> [ə'ku:stɪks] <i>n</i> <b>amorphous</b> [ə'mɔ:fəs] <i>a</i> <b>astronomy</b> [æs'trɒnəmi] <i>n</i> <b>astrophysics</b> [æstrə'fɪzɪks] <i>n</i> <b>atom</b> ['ætəm] <i>n</i> <b>atomic</b> [ə'tɒmɪk] <i>a</i> <b>biophysics</b> [ˌbaɪə(u)'fɪzɪks] <i>n</i> <b>bomb</b> [bɒm] <i>n</i> <b>calorie</b> ['kæləri] <i>n</i> <b>chemical</b> ['kemɪkəl] <i>a</i> <b>chemistry</b> ['kemɪstri] <i>n</i> <b>classic(al)</b> ['klæsɪk(ə)l] <i>a</i> <b>construction</b> [kən'strʌkʃ(ə)n] <i>n</i> <b>cosmic</b> ['kɒzmɪk] <i>a</i> <b>crystalline</b> ['krɪstəlɪn] <i>a</i> <b>electric(al)</b> [ɪ'lektrɪk(ə)l] <i>a</i> <b>electricity</b> [ɪlək'trɪsɪti] <i>n</i> <b>electromagnetic</b> [ɪ'lekt'rəʊmæg'netɪk] <i>a</i> <b>electronics</b> [ɪlək'trɒnɪks] <i>n</i>	<b>element</b> ['elɪmənt] <i>n</i> <b>energy</b> ['enədʒi] <i>n</i> <b>experiment</b> [ɪks'perɪmənt] <i>n, v</i> <b>experimental</b> [ɪks,perɪ'menti] <i>a</i> <b>formulate</b> ['fɔ:mjuleɪt] <i>v</i> <b>gas</b> [gæs] <i>n</i> <b>gaseous</b> ['gæsjəs] <i>a</i> <b>geophysics</b> [ˌdʒɪə(u)'fɪzɪks] <i>n</i> <b>gravitational</b> [ˌgrævɪ'teɪʃ(ə)n(ə)] <i>a</i> <b>historical</b> [hɪs'tɒrɪk(ə)l] <i>a</i> <b>ion</b> ['aɪən] <i>n</i> <b>joule</b> [dʒu:l] <i>n</i> <b>kinetic</b> [kaɪ'netɪk]/[kaɪ'netɪk] <i>a</i> <b>magnetism</b> ['mæɡnɪtɪzm] <i>n</i> <b>mass</b> [mæs] <i>n</i> <b>material</b> [mə'tɪəriəl] <i>n, a</i> <b>mathematical</b> [ˌmæθɪ'mætɪkəl] <i>a</i> <b>mechanical</b> [mɪ'kænɪkəl] <i>a</i> <b>mechanics</b> [mɪ'kænɪks] <i>n</i> <b>method</b> ['meθəd] <i>n</i>	<b>molecular</b> [məu'lekjələ] <i>a</i> <b>molecule</b> ['mɒlɪkjʊ:l] <i>n</i> <b>organism</b> ['ɔ:ɡənɪzm] <i>n</i> <b>period</b> ['pɪ(ə)rɪəd] <i>n</i> <b>philosopher</b> [frɪ'lsəfə] <i>n</i> <b>physical</b> ['fɪzɪk(ə)l] <i>a</i> <b>physics</b> ['fɪzɪks] <i>n</i> <b>polymer</b> ['pɒlɪmə] <i>n</i> <b>potential</b> [pə(u)'tenʃ(ə)l] <i>a</i> <b>quantum</b> ['kwɒntəm] <i>n (pl -ta)</i> <b>reactor</b> [rɪ(:)'æktə] <i>n</i> <b>result</b> [rɪ'zʌlt] <i>n</i> <b>structure</b> ['strʌktʃə] <i>n</i> <b>technology</b> [tek'nɒlədʒɪ] <i>n</i> <b>temperature</b> ['tempərɪtʃə] <i>n</i> <b>theoretic(al)</b> [θɪə'retɪk(ə)l] <i>a</i> <b>thermodynamics</b> ['θə:məʊdər'næmɪks] <i>n</i> <b>theory</b> ['θiəri] <i>n</i> <b>type</b> ['taɪp] <i>n</i>
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**absence** ['æbs(ə)ns] *n* отсутствие  
**according to** [ə'kɔ:dɪŋ] *adv* согласно, в соответствии с, соответственно  
**accordingly** [ə'kɔ:dɪŋli] *adv* следовательно  
**accurate** ['ækjʊrɪt] *a* точный, правильный  
**actual** ['æktʃʊəl] *a* действительный  
**adoption** [ədɒpʃ(ə)n] *n* 1) принятие; 2) выбор  
**aim at** [eɪm] *v* стараться, стремиться  
**amount** [ə'maʊnt] *n* количество  
**ancient** ['eɪnʃənt] *a* древний; античный  
**arrangement** [ə'reɪndʒmənt] *n* расположение  
**attempt** [ə'tempt] *v* пытаться, пробовать  
**behaviour** [brɪ'heɪvjə] *n* поведение  
**body** ['bɒdi] *n* тело  
**branch** [brɑ:ntʃ] *n* ветвь, отрасль, раздел  
**break down** [breɪk] *v* (broke; broken) делить  
**capacity** [kə'pæsɪti] *n* способность  
**carry** ['kæri] *v* нести, переносить; передавать  
**celestial** [srɪ'lestʃəl] *a* небесный, космический  
**certain** ['sə:tn] *a* 1) определенный; 2) некий, некоторый  
**compound** ['kɒmpaʊnd] *n* смесь, соединение  
**comprise** [kəm'praɪz] *v* включать, заключать в себе, охватывать; содержать, вмещать

**concept** ['kɒnsəpt] *n* понятие, идея  
**consider** [kən'sɪdə] *v* считать, полагать  
**contain** [kən'teɪn] *v* содержать, вмещать  
**correlate** ['kɒrɪleɪt] *v* устанавливать соотношения, находиться в связи  
**cover** ['kʌvə] *v* охватывать; относиться (к)  
**deal with** [di:l] *v* (dealt) иметь дело с, рассматривать  
**debt** [det] *n* долг  
**definite** ['defɪnɪt] *a* определенный  
**depend (on/upon)** [drɪ'pend] *v* зависеть от  
**detectable** [drɪ'tektəbl] *a* обнаруживаемый  
**determine** [drɪ'tə:mɪn] *v* определять, устанавливать  
**develop** [drɪ'veləp] *v* развивать(ся)  
**devise** [drɪ'vaɪz] *v* разрабатывать, изобретать  
**different** ['dɪfrənt] *a* разный, различный  
**direct** [drɪ'rekt] / [daɪ'rekt] *a* прямой  
**discovery** [dɪs'klʌv(ə)ri] *n* открытие  
**discrete** [dɪs'kri:t] *a* раздельный, состоящий из раздельных частей  
**distinct** [dɪs'tɪŋkt] *a* отдельный  
**distinguish** [dɪs'tɪŋɡwɪʃ] *v* различать, отличать  
**divide** [drɪ'vaɪd] *v* разделять; *mat.* делить  
**due to** [dju:] *adv* благодаря

<p><b>engineering</b> [ˌendʒɪˈnɪərɪŋ] <i>n</i> техника, технология</p> <p><b>equation</b> [ɪˈkweɪʃ(ə)n] <i>n</i> уравнение</p> <p><b>exist</b> [ɪgˈzɪst] <i>v</i> существовать; находиться</p> <p><b>expand</b> [ɪksˈpænd] <i>v</i> расширять(ся), увеличивать(ся) в объеме</p> <p><b>experience</b> [ɪksˈpɪəriəns] <i>n</i> (жизненный) опыт</p> <p><b>field</b> [fiːld] <i>n</i> поле; область</p> <p><b>fill</b> [fɪl] <i>v</i> наполнять, заполнять</p> <p><b>fixed</b> [fɪkst] <i>a</i> постоянный; неизменный</p> <p><b>force</b> [fɔːs] <i>n</i> сила</p> <p><b>former</b> [fɔːmə] <i>a</i> предшествующий;  <b>the former</b> – первый (из двух названных)</p> <p><b>free</b> [friː] <i>a</i> свободный</p> <p><b>fundamental</b> [ˌfʌndəˈmentl] <i>a</i> основной</p> <p><b>govern</b> [ˈgʌvən] <i>v</i> управлять; влиять</p> <p><b>heat</b> [hiːt] <i>n</i> физ. тепло</p> <p><b>height</b> [ˈhaɪt] <i>n</i> высота</p> <p><b>hence</b> [hens] <i>adv</i> следовательно</p> <p><b>hydrogen</b> [ˈhaɪdrɪdʒən] <i>n</i> водород</p> <p><b>include</b> [ɪnˈkluːd] <i>v</i> содержать, включать</p> <p><b>interconvertible</b> [ˌɪntəkənˈvɜːtɪbl] <i>a</i> взаимозаменяемый, равноценный</p> <p><b>knowledge</b> [ˈnɒlɪdʒ] <i>n</i> знание, познания</p> <p><b>law</b> [lɔː] <i>n</i> закон</p> <p><b>liquid</b> [ˈlɪkwɪd] <i>n</i> жидкость</p> <p><b>matter</b> [ˈmætə] <i>n</i> материя, вещество</p> <p><b>mean</b> [miːn] <i>v</i> (meant) значить, означать</p> <p><b>measure</b> [ˈmeʒə] 1) <i>n</i> мера; 2) <i>v</i> измерять</p> <p><b>mercury</b> [ˈmɜːkjʊəri] <i>n</i> ртуть</p> <p><b>merge</b> [ˈmɜːdʒ] <i>v</i> сливаться, соединяться</p> <p><b>motion</b> [ˈməʊʃ(ə)n] <i>n</i> движение</p> <p><b>move</b> [muːv] <i>v</i> двигаться, передвигаться</p> <p><b>natural</b> [ˈnætʃrəl] <i>a</i> естественный, природный</p> <p><b>nature</b> [ˈneɪtʃə] <i>n</i> природа</p> <p><b>nuclear</b> [ˈnjuːklɪə] <i>a</i> ядерный</p> <p><b>object</b> [ˈɒbdʒɪkt] <i>n</i> предмет; объект; тело</p> <p><b>observable</b> [əbˈzɜːvəbl] <i>a</i> заметный, различимый; который можно наблюдать</p> <p><b>observation</b> [ˌəbzəˈveɪʃ(ə)n] <i>n</i> наблюдение</p> <p><b>occupy</b> [ˈɒkjupaɪ] <i>v</i> 1) занимать</p> <p><b>occur</b> [əˈkɜː] <i>v</i> 1) случаться, происходить, иметь место; 2) встречаться, попадаться;</p> <p><b>origin</b> [ˈɔːrɪdʒɪn] <i>n</i> источник, начало</p> <p><b>originally</b> [əˈrɪdʒɪnəli] <i>adv</i> первоначально</p> <p><b>overlap</b> [ˌəʊvəˈlæp] <i>v</i> частично совпадать, перекрывать</p> <p><b>owe</b> [əʊ] <i>v</i> быть обязанным, быть в долгу</p>	<p><b>oxygen</b> [ˈɒksɪdʒən] <i>n</i> кислород</p> <p><b>particle</b> [ˈpɑːtɪkl] <i>n</i> частица</p> <p><b>phenomenon</b> [fɪˈnɒmɪnən] <i>n</i> (pl -на) явление</p> <p><b>predict</b> [prɪˈdɪkt] <i>v</i> предсказывать</p> <p><b>presence</b> [prezns] <i>n</i> присутствие</p> <p><b>pressure</b> [ˈpreʃə] <i>n</i> давление</p> <p><b>primarily</b> [ˈpraɪməri] <i>adv</i> главным образом, прежде всего</p> <p><b>quantity</b> [ˈkwɒntəti] <i>n</i> количество, величина</p> <p><b>radiant</b> [ˈreɪdjənt] <i>a</i> 1) светящийся, излучающий свет; 2) сияющий, лучистый;  <b>radiant energy</b> – лучистая энергия</p> <p><b>raise</b> [reɪz] <i>v</i> поднимать</p> <p><b>range</b> [ˈreɪndʒ] <i>n</i> диапазон, область действия</p> <p><b>rapid</b> [ˈræpɪd] <i>a</i> быстрый, скорый</p> <p><b>relation</b> [rɪˈleɪʃ(ə)n] <i>n</i> отношение, связь</p> <p><b>relativity</b> [ˌreləˈtɪvɪti] <i>n</i> относительность</p> <p><b>research</b> [rɪˈsɜːtʃ] 1) <i>n</i> исследование (научное); 2) <i>v</i> (into) изучать, исследовать</p> <p><b>rest</b> [rest] <i>n</i> покой; состояние покоя</p> <p><b>retain</b> [rɪˈteɪn] <i>v</i> поддерживать; сохранять</p> <p><b>return</b> [rɪˈtɜːn] <i>v</i> возвращаться; идти обратно</p> <p><b>science</b> [saɪəns] <i>n</i> наука</p> <p><b>scientific</b> [ˌsaɪənˈtɪfɪk] <i>a</i> научный</p> <p><b>seek</b> [siːk] <i>v</i> (sought) 1) искать; 2) стремиться</p> <p><b>separate</b> 1) <i>a</i> [ˈseprɪt] отдельный; 2) <i>v</i> [ˈsepəreɪt] отделять(ся), разделять(ся)</p> <p><b>shape</b> [ʃeɪp] <i>n</i> форма, вид, образ</p> <p><b>society</b> [səˈsaɪəti] <i>n</i> общество</p> <p><b>solid</b> [ˈsɒlɪd] 1) <i>a</i> твердый; 2) <i>n</i> твердое тело</p> <p><b>sound</b> [saʊnd] <i>n</i> звук</p> <p><b>source</b> [sɔːs] <i>n</i> источник</p> <p><b>space</b> [speɪs] <i>n</i> пространство, космос</p> <p><b>spring</b> [sprɪŋ] <i>n</i> пружина</p> <p><b>state</b> [steɪt] <i>n</i> состояние</p> <p><b>stretch</b> [stretʃ] <i>v</i> растягивать(ся)</p> <p><b>substance</b> [ˈsʌbstəns] <i>n</i> материя, вещество</p> <p><b>transform</b> [trænsˈfɔːm] <i>v</i> превращать(ся), изменять(ся), преобразовать(ся)</p> <p><b>various</b> [ˈveəriəs] <i>a</i> различный, разный</p> <p><b>velocity</b> [vɪˈləsɪti] <i>n</i> скорость</p> <p><b>vessel</b> [vesl] <i>n</i> сосуд</p> <p><b>vibrate</b> [vaɪˈbreɪt] <i>v</i> вибрировать, колебаться</p> <p><b>volume</b> [ˈvɒljʊːm] <i>n</i> объем</p> <p><b>wave</b> [weɪv] <i>n</i> волна</p> <p><b>world</b> [wɜːld] <i>n</i> мир, свет; вселенная</p> <p><b>word</b> [wɜːd] <i>n</i> слово</p>
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<b>to be composed</b> [kə'mpəuzd] <b>of</b> – состоять из <b>to be equal</b> ['i:kw(ə)l] <b>to</b> – равняется, равно <b>to be related to / with</b> – быть связанным с; иметь отношение; касаться; зависеть от <b>either ... or</b> – или ... или <b>neither ... nor</b> – ни ... ни <b>in many /all/ respects</b> [rɪs'pekts] – во многих /всех/ отношениях <b>in terms of</b> – исходя из, на основании, с точки зрения	<b>the (wider) ... the (more important) ...</b> – чем (шире) ... тем (важнее) ... <b>up to</b> – до, вплоть до  <b>abbreviations:</b> <i>e.g.</i> (Lat. – <i>exempli gratia</i> ) = <b>for example</b> – например <i>etc.</i> (Lat. – <i>et cetera</i> ) = <b>and so on</b> – и т.д. <i>i.e.</i> (Lat. – <i>id est</i> ) = <b>that is</b> – т.е.
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**Task I. Pay attention to ...****I. Pay attention to the pronunciation of the following words.**

- a) atom ['ætəm] – atomic [ə'tɒmɪk]; experiment [ɪks'perɪmənt] – experimental [ɪks,perɪ'mentl];  
 know [nəʊ] – knowledge ['nɒlɪdʒ]; molecule ['mɒlɪkjʊ:l] – molecular [məʊ'lekjʊlə]; nature  
 ['neɪtʃə] – natural ['nætʃrəl]; observe [əb'zə:v] – observation [,əbzə'veɪʃ(ə)n]; origin ['ɒrɪdʒɪn] –  
 original(ly) [ə'ɒrɪdʒɪnə(lɪ)]; relate [rɪ'leɪt] – relative ['relatɪv] – relativity [,relə'tɪvɪtɪ]; theory  
 ['θɪəri] – theoretic(al) [θɪə'retɪk(ə)]; transform [træns'fɔ:m] – transformation [,trænsfə'meɪʃ(ə)n]
- b) **separate** 1) a ['seprɪt] отдельный; 2) v ['sepəreɪt] отделять(ся), разделять(ся)

*Read and translate the sentences. Pay special attention to the words in dark type.*

- Chemistry studies how atoms and molecules join and **separate**.
- A body is a **separate** piece of matter.

**II. Pay attention to the following derivatives. Read and translate them.**

atom → atomic; arrange → arrangement;  
 construct → construction; cosmos → cosmic;  
 convert → convertible → interconvertible;  
 definite → indefinite; detect → detectable;  
 develop → development;  
 difference ← **differ** → different;  
 discovery ← **discover** → discoverer;  
 divide → division → subdivision;  
 experiment → experimental → experimentally;  
 gas → gaseous; history → historical;  
 mathematics → mathematical; measure → measurement;  
 mechanics → mechanical; molecule → molecular;  
 move → movement; nature → natural;  
 observable ← **observe** → observation;  
 origin → original → originally; philosophy → philosopher;  
 physicist ← **physics** → physical;  
 relation ← **relate** → relative → relativity;  
                   ↓                  ↓  
 correlation ← correlate;  
 separate → separation;  
 transform → transformation;  
 theory → theoretical → theoretically

**Suffixes:**

**-able/-ible** v → a  
**-al** n → a  
**-ation/-(t)ion/sion** v → n  
**-ar** n → a  
**-ence** v → n  
**-ent** v → a  
**-er** n/v → n  
**-ic(al)** n → a  
**-ist** n → n  
**-ive** v → a  
**-ity** a → n  
**-ly** a → adv  
**-ment** v → n  
**-ous** n → a  
**-y** v → n

**Prefixes:**

**co-** 'together; with'  
**in-** 'the opposite of' / 'not'  
**inter-** 'from one to another' /  
 'between'  
**sub-** 'a smaller part of'

A fuller list of affixes is given on  
 pp 9-13.

**III. Pay attention to 'noun + noun' combinations.**

*Read and translate them.*

atom and molecule separation; (celestial) body movement; quantum physics; heat energy; the  
 relativity theory; room temperature



☞ IV. Pay attention to the plural of the following nouns.

datum – data\*; quantum – quanta; phenomenon – phenomena

\* In Latin, **data** is the plural of **datum** and, historically and in specialized scientific fields, it is also treated as a plural in English, taking a plural verb, as in ‘the data were collected and classified’. In modern non-scientific use, however, it is generally not treated as a plural. Instead, it is treated as a mass noun, similar to a word like **information**, which takes a singular verb. Sentences such as ‘data was collected over a number of years’ are now widely accepted in standard English.

Choose the correct form of the noun.

1. Light is a physical (*phenomenon / phenomena*). It propagates in the form of a great number of (*quantum / quanta*). (*Quantum / quanta*) is a discrete quantity of energy.
2. Optics researches into these physical (*phenomenon / phenomena*).
3. Experimental (*datum / data*) help theorists to formulate laws.



V. Pay attention to the following international words. They are often called ‘false friends of a translator’ as they can be translated in different ways.

**accurate** [ˈækjʊrɪt] *a* 1) точный, правильный; 2) тщательный; 3) аккуратный

**actual** [ˈæktʃʊəl] *a* 1) фактически существующий; действительный; подлинный; актуальный; 2) текущий, современный

**concept** [ˈkɒnsəpt] *n* понятие, идея; общее представление; концепция

**element** [ˈelɪmənt] *n* 1) элемент; составная часть; 2) хим. элемент; 3) *pl* основы; азы

**engineering** [ˌendʒɪˈnɪərɪŋ] 1) *a* прикладной (о науке); 2) *n* 1) инженерное искусство; техника; технология; 2) машиностроение; 3) разработка; проектирование

**fundamental** [ˌfʌndəˈmentl] 1) *a* основной; фундаментальный; коренной; существенный;

2) *n* (обыкн. *pl.*) 1) основное правило; принцип; 2) основы

**material** [məˈtɪəriəl] 1) *n* 1) материал, вещество; 2) факты, данные, материал

**matter** [ˈmætə] *n* 1) вещество; 2) материя; 3) предмет (обсуждения); 4) вопрос, дело

**natural** [ˈnætʃrəl] *a* 1) естественный, природный; 2) настоящий, натуральный; 3) естественный, относящийся к естествознанию; 4) обычный, нормальный; понятный

**nature** [ˈneɪtʃə] *n* 1) природа; 2) натура; естество; организм; 3) сущность, основное свойство; 4) натура, характер, нрав; 5) род, сорт; класс

**object** [ˈɒbdʒɪkt] *n* 1) предмет; вещь; 2) объект (изучения и т.п.); 3) цель; 4) тело; 5) грам. дополнение

**originally** [əˈrɪdʒɪnəli] *adv* 1) первоначально; 2) по происхождению; 3) оригинально

**phenomenon** [fɪˈnɒmɪnən] *n* 1) явление, феномен; 2) необыкновенное явление; феномен

**progress** *n* [ˈprəʊɡres] 1) прогресс, развитие; движение вперед; 2) успехи, достижение; 3) течение, ход, развитие

**substance** [ˈsʌbstəns] *n* 1) вещество; 2) материя, субстанция; 3) сущность, суть, содержание; 4) твердость; плотность; густота; 5) имущество, состояние

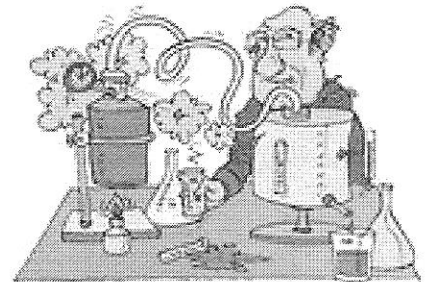
**transformation** [ˌtrænsfəˈmeɪʃ(ə)n] *n* 1) превращение, изменение, преобразование; 2) эл. трансформация; 3) мат. преобразование; 4) парик

Translate the following sentences. Pay special attention to the words in bold.

1. Physics studies various phenomena in **nature** that can be **accurately** described in terms of **matter** and energy.
2. The basic **concepts** in all physical **phenomena** are the **concepts** of **matter** and energy.
3. **Originally** physics included all the **natural** sciences.
4. Quantum physics is **fundamental** for modern **engineering**.
5. Experiments give us **accurate** knowledge of the **actual** behaviour of **natural phenomena**.
6. The technical **progress** of a society is directly related to the results of physical research.
7. Any **object** or any **material** or any organism is composed of **matter**.
8. All **substances**, compounds and **elements** are **matter**.
9. Water, ice and snow are the same **substance** in different states.
10. This **material** has some **substance**. (It is fairly solid.)
11. **Transformation** of one form of energy into another can only occur in the presence of **matter**.

VI. Pay attention to the following easily confused words.

- a) **classic** ['klæsɪk] а классический, образцовый, типичный (a *classic style / example / case*)  
**classical** ['klæsɪk(ə)] а классический (относящийся к классическому периоду 18<sup>th</sup> века, напр. *classical physics / literature*)
- b) **historic** [hɪs'tɔːrɪk] а исторический (имеющий историческое значение, напр. a *historic house*)  
**historical** [hɪs'tɔːrɪk(ə)] а исторический (исторически установленный; относящийся к истории, событиям или персонажам связанные с историей, напр. a *historical research / period / figure*)
- c) **data** ['deɪtə] n (pl от datum) данные  
**date** [deɪt] n дата, свидание
- d) **experience** [ɪks'pɪəriəns] n опыт (жизненный)  
**experiment** [ɪks'perɪmənt] n опыт, эксперимент
- e) **word** [wɜːd] n слово;  
**in a word** – одним словом, короче говоря  
**world** [wɜːld] n мир, свет; вселенная
- f) **first** [fɜːst] num первый  
**at first** – сперва; на первых порах, вначале; (**first** [fɜːst] n начало)



Choose the correct word to complete the meaning of the sentences.

1. Greek philosophers were (the first / at first) to begin researching into the physical (word / world).
2. The (word / world) "physics" takes its origin from the Greek (word / world) meaning nature.
3. Physics (the first / at first) included all the natural sciences. Now other sciences depend on the knowledge of physical phenomena, in a (word / world), they owe a debt to physics.
4. According to the (historic / historical) periods physics is broken down into (classic / classical) and modern.
5. The major division of the mechanics discipline separates (classic / classical) mechanics from quantum one.
6. The discovery of quantum physics has the (historic / historical) significance.
7. On the basis of experimental (data / dates) theoretical physics formulates laws.
8. Every physical law is based on the (experience / experiment).
9. The wider the range of (experience / experiment) covered by a physical law, the more important it is.
10. Water is a (classic / classical) example of liquid state of matter.
11. He insisted on this (data / dates / datum / date) of conducting the experiment.

**Fun with  
Words**
**PLAY UPON WORDS  
ИГРА СЛОВ**

\*\*\*

**positive** а 1) положительный, позитивный; 2) уверенный

Two hydrogen atoms meet. One says, "I've lost my electron." The other says, "Are you sure?" The first replies, "I'm positive."

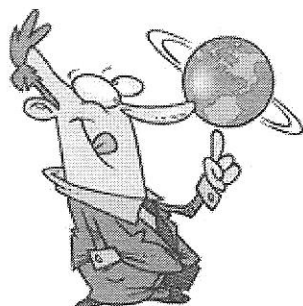
***The questions to get you plucked***

*Вопросы на засыпку*

\*\*\*

**branch** v 1) ветка (дерева); 2) филиал (банка, учебного заведения); 3) раздел (науки); отрасль (промышленности)

If money does not grow on trees, why do banks have so many branches?



\*\*\*

**to travel to the four corners of the world** – объехать весь мир

If the world is round, how can we travel to the four corners of it?

\*\*\*

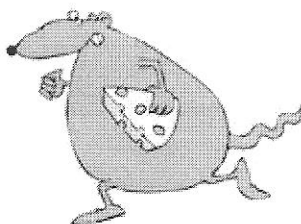
If the world is getting smaller, why does it take me longer to get to work?

**MNEMONIC DEVICES**
**МНЕМОНИЧЕСКИЕ ПРИЕМЫ**

*The following phrases help you to remember the spelling of the word SEPARATE.*

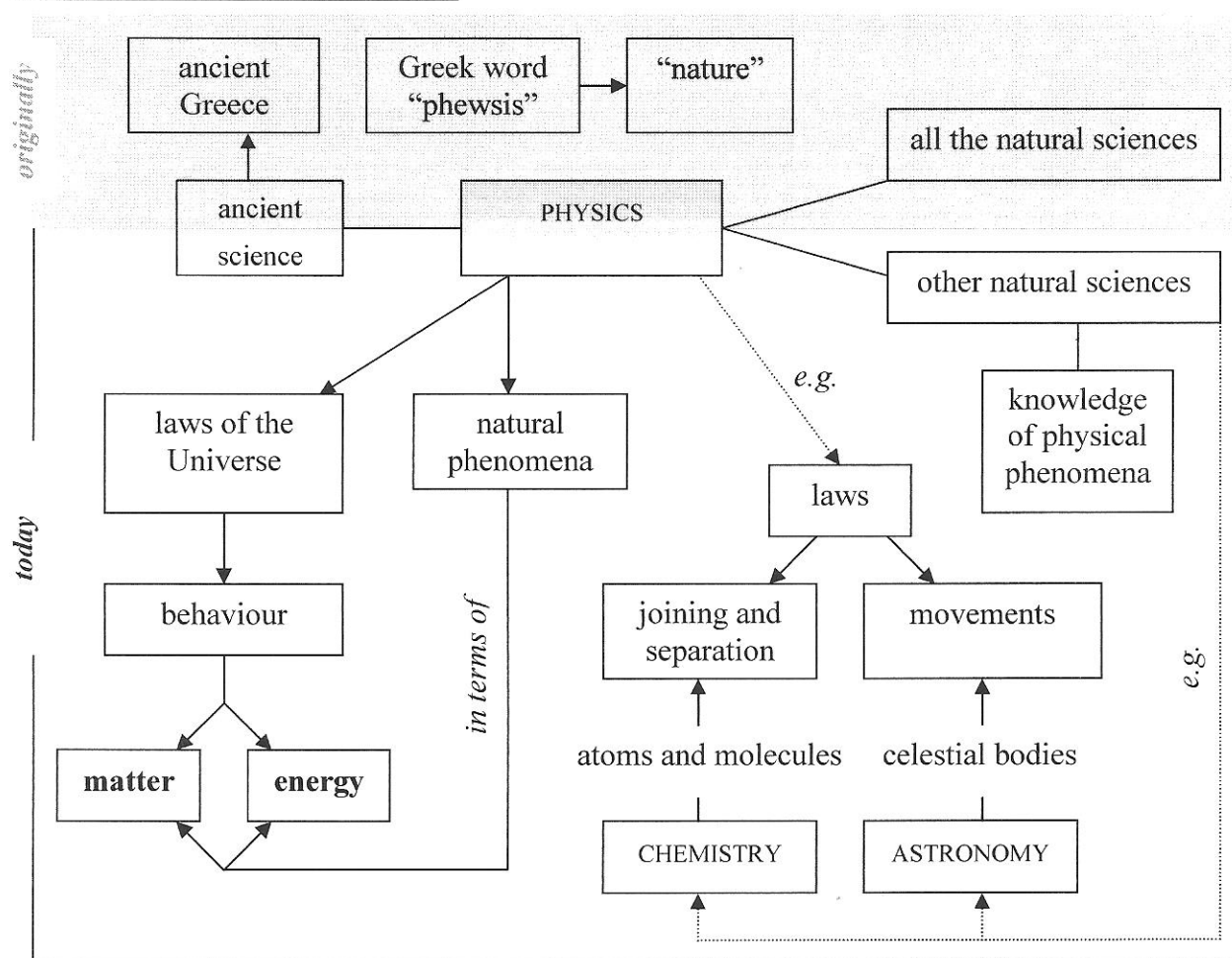
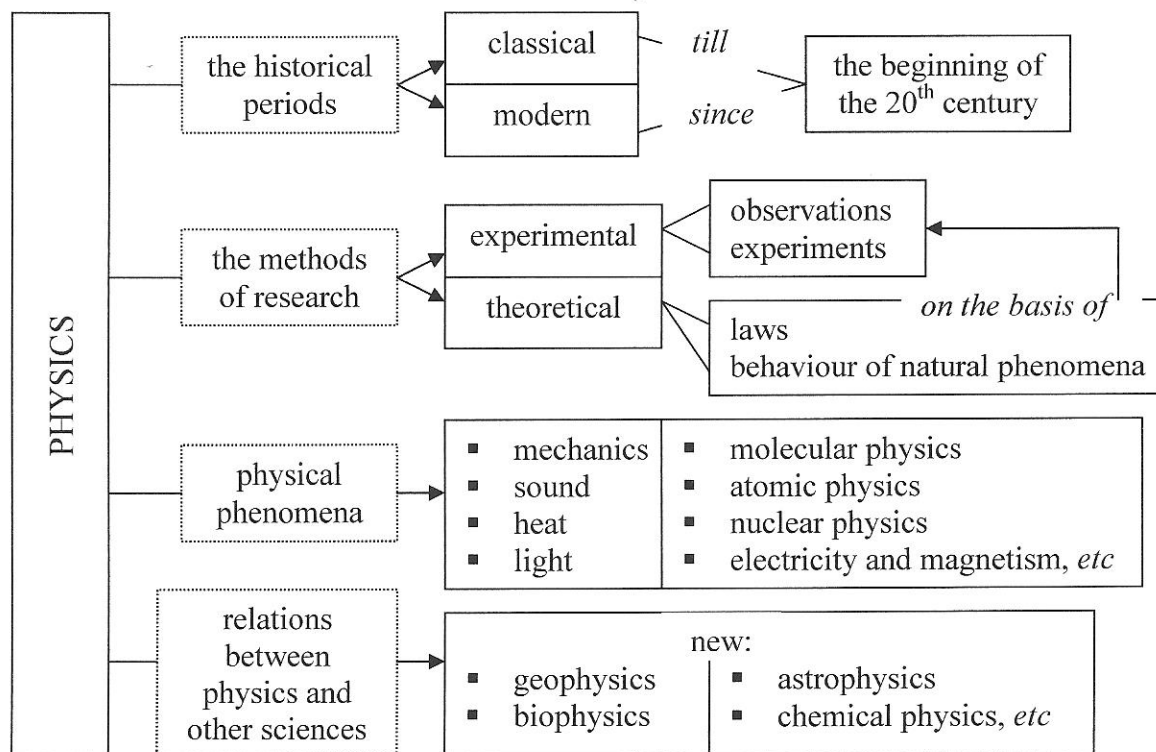
- There was a farmer named **Sep** and one day his wife saw a **rat**. She yelled, "**Sep! A rat – E!!!**"
- There is **a rat** in **separate**.
- Always remember **a rat** when you spell **separate**.

A fuller list of spelling mnemonics is given on page 16.



## Stage 2 – Schemes

SCHEME 1.1

SCHEME 1.2  
Branches of Physics



**Task II. Do the following exercises, using the schemes given on the left-hand page as a prompt.**

### SCHEME 1.1

**I. Complete the sentences:**

1. Physics is an ... science.
2. The study of physics began in ... .
3. The word “physics” takes its origin from the ... “phewsis” that means “...”.
4. Originally physics included all the ... .
5. Today physics studies the laws of the Universe that govern the ... of ... and ... .
6. Physics deals with ... that can be described in terms of ... and ... .
7. Other sciences depend on the knowledge of ... .
8. For example, chemistry studies the joining and separation of ... and ...; physics studies the laws that govern those ... and ... .
9. Astronomy deals with the ... of ...; physics deals with the laws that govern those ....

**II. Answer the following questions:**

1. Where did the study of physics begin?
2. What word does the word “physics” take its origin from? What does it mean?
3. What sciences did physics include originally?
4. What does physics study today?
5. Does the development of other natural sciences depend on the knowledge of physical phenomena? Can you give an example to prove that?

**III. Discuss the science of physics.**

### SCHEME 1.2

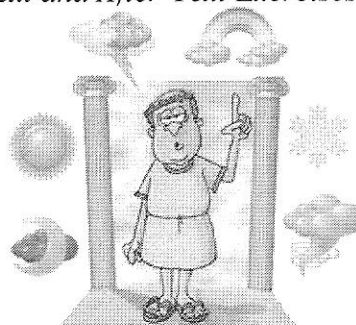
**I. Complete the sentences:**

1. According to the historical periods physics is divided into ... and ... .
2. ... physics lasted till the beginning of the 20<sup>th</sup> century.
3. Since the beginning of the 20<sup>th</sup> century up to now is the period of ... physics.
4. ... the methods of research physics is broken down into experimental and theoretical.
5. ... physics makes observations and conducts experiments.
6. ... physics formulates ... and predicts the ... of natural phenomena on the basis of experimental data.
7. According to ... physics is divided into the following fields: mechanics, sound, heat, light, molecular, atomic and nuclear physics, electricity and magnetism, *etc.*
8. Due to ... physics and other natural sciences the new branches such as ..., ..., ..., *etc.* are being developed at present.

**II. Answer the following questions:**

1. According to the historical periods what branches is physics divided into?
2. According to the research methods what branches is physics divided into?
3. What is experimental /theoretical/ physics?
4. According to physical phenomena what fields is physics divided into?
5. What new branches are being developed due to relations between physics and other natural sciences?

**III. Talk about the branches of physics.**

**Stage 3 – Text****Physics**

Physics is one of the most ancient sciences, studying various phenomena in nature: mechanical motion, heat, sound, electricity, magnetism, light, *etc.* It aims to research into natural laws and natural forces. The study of physics began in ancient Greece, as philosophers attempted to understand the physical world. The word “physics” takes its origin from the Greek word “phewsis” meaning nature. With the adoption of the scientific method, physics at first included all the natural sciences. Today, physics seeks to discover the laws of the universe that govern the behaviour of matter and energy. In all cases physics deals primarily with phenomena that can be accurately described in terms of matter and energy. Hence, the basic concepts in all physical phenomena are the concepts of matter and energy. Accordingly, other sciences and technologies owe a debt to physics and their development depends in many respects on the knowledge of physical phenomena. For example, chemistry studies how atoms and molecules join and separate; physics studies the laws that govern the joining and separation. Astronomy studies the movements of celestial bodies; physics deals with the laws that govern those movements.

The development of physics is considered to have two periods. According to these periods physics is broken down into classical and modern, though many subdivisions of the two overlap. Classical physics comprises the period up to the beginning of the 20<sup>th</sup> century. It includes Newtonian mechanics, thermodynamics, statistical mechanics, acoustics, optics, electricity, and magnetism. Since the beginning of the 20<sup>th</sup> century up to now is the second period which is known as modern. Modern physics includes relativistic mechanics, atomic, nuclear and quantum physics. Knowledge of physics since the discovery of quantum physics has become fundamental in modern physics. This science is also fundamental to modern engineering including cosmic engineering, nuclear energy, quantum electronics, *etc.* The technical progress of a society is directly related to the results of physical research.

According to the methods of research physics is divided into two great branches, experimental and theoretical (mathematical) physics. The former is the science of making observations and devising experiments, which give us accurate knowledge of the actual behaviour of natural phenomena. On the basis of experimental facts theoretical physics formulates laws and predicts the behaviour of natural phenomena. Every physical law is based on experiments and is devised to correlate and to describe accurately these experiments. The wider (is) the range of experience covered by such a law, the more important it is. In science, a theory is usually not just a guess but rather a mathematical construction that predicts something about the physical world. For example, Albert Einstein’s theory of relativity is a set of equations that describes the behaviour of bodies moving at high velocities and in strong gravitational fields.

According to physical phenomena studied by scientists physics may be divided into certain fields: mechanics, sound, heat, electricity and magnetism, light, molecular, atomic and nuclear physics, *etc.* These different fields are not distinct but merge into each other. Due to direct relations between physics and other natural sciences the new branches such as geophysics, biophysics, astrophysics, chemical physics, *etc.* are rapidly being developed at present.

## NOTES ON THE TEXT

1. The development of physics is considered to have two periods. – Считается, что развитие физики имеет два периода.
2. **Albert Einstein** [’ælbət ’aɪnstain] – Альберт Эйнштейн

**Task III. Read the text and then do the following exercises.****I. In the text, find the English equivalents for the words and phrases below:**

- |                                       |   |
|---------------------------------------|---|
| ○ происходит от                       | ○ во многих отношениях зависит от                 |
| ○ ее целью является исследование      | ○ физика делится на ( <i>find 2 equivalents</i> ) |
| ○ стремится открывать законы          | ○ многие подразделения этих двух                  |
| ○ законы Вселенной, которые управляют | (разделов) частично совпадают                     |
| ○ прежде всего рассматривает / имеет  | ○ охватывает период                               |
| дело с                                | ○ вплоть до наших дней                            |
| ○ можно точно описать с точки зрения  | ○ современная технология                          |
| материи и энергии                     | ○ не просто догадка, а скорее                     |
| ○ находятся в долгу у физики          | ○ система уравнений                               |

**II. Choose the right variant.**

- The word “physics” takes its origin from the Greek word meaning (“*physical world*” / “*nature*”).
- (*Chemistry / Physics*) studies how atoms and molecules join and separate; (*chemistry / physics*) studies the laws that govern the joining and separation.
- The development of physics is considered to have (*two / three*) periods.
- (*Classical / Modern*) physics comprises the period up to the beginning of the 20<sup>th</sup> century.
- (*Classical / Modern*) physics includes Newtonian mechanics, thermodynamics, statistical mechanics, acoustics, optics, electricity, and magnetism.
- Since the beginning of the 20<sup>th</sup> century up to now is the second period, which is known to be (*classical / modern*).
- (*Classical / Modern*) physics includes relativistic mechanics, atomic, nuclear and quantum physics.
- According to (*the methods of research / physical phenomena*) physics is divided into two great branches.
- (*Experimental / Theoretical*) physics makes observations and carries out experiments, which give us accurate knowledge of the actual behaviour of natural phenomena.
- (*Experimental / Theoretical*) physics is the science of formulating laws and predicting the behaviour of natural phenomena on the basis of (*experimental / physical*) facts.
- The wider is the range of experience covered by a physical law, the (*more / less*) important it is.
- A theory (*is / is not*) just a guess that predicts something about the physical world.
- According to (*the methods of research / physical phenomena*) physics may be broken down into certain fields.
- Different fields of physics, *e.g.* mechanics, sound, heat, electricity and magnetism, light, molecular, atomic and nuclear physics, *etc.*, (*are / are not*) distinct.

**III. Fill in the correct preposition.**

- Physics aims ... researching ... natural laws and natural forces.
- The word “physics” takes its origin ... the Greek word “*phewsis*” meaning nature.
- Physics deals ... phenomena that can be accurately described ... terms of matter and energy.
- Other sciences owe a debt ... physics.
- Their development depends ... the knowledge of physical phenomena.
- Quantum physics is also fundamental ... modern engineering.
- The technical progress of a society is directly related ... the results of physical research.
- According ... the methods of research physics is divided ... two great branches, experimental and theoretical (mathematical) physics.
- ... the basis ... experimental facts theoretical physics formulates laws and predicts the behaviour ... natural phenomena.
- Every physical law is based ... experiments.

IV. Use suitable forms of the words from the box instead of the underlined ones.

1. Physics studies various phenomena in nature.
2. The study of physics began in ancient Greece, as philosophers attempted to understand the physical world.
3. Physics at first included all the natural sciences.
4. Today, physics seeks to discover the laws of the universe that govern the behaviour of matter and energy.
5. The basic concepts in all physical phenomena are the concepts of matter and energy.
6. Astronomy studies the movements of celestial bodies.
7. Physics is broken down into classical and modern.
8. According to the scientific methods physics is divided into experimental and theoretical.
9. Experimental physics conducts experiments.
10. The technical progress of a society is related to the results of physical research.

- a) fundamental
- b) heavenly
- c) research
- d) to deal with
- e) to depend on
- f) to divide
- g) to make
- h) at present
- i) originally
- j) when

V. Rewrite each sentence so that your sentence has a similar meaning to the given one.

#### IN OTHER WORDS

- ❖ Physics is one of the most ancient sciences **studying** various phenomena in nature  
*Physics is one of the most ancient sciences **that studies** various phenomena in nature.*

1. The word “physics” takes its origin from the Greek word “phewsis” **meaning** nature.
2. Physics discovers the laws of the universe **that govern** the behaviour of matter and energy.
3. Experimental physics makes observations and conducts experiments **that give** us accurate knowledge of the actual behaviour of natural phenomena.
4. In science, a theory is usually not just a guess but rather a mathematical construction **that predicts** something about the physical world.
5. Albert Einstein’s theory of relativity is a set of equations **that describes** the behaviour of bodies **moving** at high velocities and in strong gravitational fields.
6. Physics deals primarily with phenomena **that are described** in terms of matter and energy.

VI. Make up as many sentences as possible, using the table as a prompt:

A) e.g. *Physics is the science that deals with various phenomena in nature.*

<ul style="list-style-type: none"> <li>● Physics</li> <li>● Chemistry</li> <li>● Astronomy</li> </ul>	(is the science that)	<ul style="list-style-type: none"> <li>● deals with</li> <li>● studies</li> <li>● researches into</li> <li>● aims at researching into</li> </ul>	<ul style="list-style-type: none"> <li>● various phenomena in nature.</li> <li>● natural laws and natural forces.</li> <li>● how atoms and molecules join and separate.</li> <li>● how celestial bodies move.</li> <li>● joining and separation of atoms and molecules.</li> <li>● the movements of celestial bodies.</li> <li>● atoms and molecules and their joining and separation.</li> <li>● celestial bodies and their movements.</li> <li>● the laws of the universe that govern the behaviour of matter and energy.</li> <li>● the laws that govern the joining and separation of atoms and molecules.</li> <li>● the laws that govern the movements of celestial bodies.</li> </ul>
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B) e.g. *Various phenomena in nature are dealt with in physics.*

<ul style="list-style-type: none"> <li>• Various phenomena in nature</li> <li>• Natural laws and natural forces</li> <li>• How atoms and molecules join and separate</li> <li>• The joining and separation of atoms and molecules</li> <li>• The movement of celestial bodies</li> <li>• The laws of the universe that govern the behaviour of matter and energy</li> <li>• The laws that govern the joining and separation of atoms and molecules</li> <li>• The laws that govern the movement of celestial bodies</li> </ul>	<ul style="list-style-type: none"> <li>• is</li> <li>• are</li> </ul>	<ul style="list-style-type: none"> <li>• dealt with</li> <li>• studied</li> <li>• researched into</li> </ul>	<ul style="list-style-type: none"> <li>• in physics.</li> <li>• in chemistry.</li> <li>• in astronomy.</li> </ul>
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C) e.g. *Physics is the science of studying natural phenomena.*

<ul style="list-style-type: none"> <li>• Physics</li> <li>• Theoretical physics</li> <li>• Experimental physics</li> </ul>	<ul style="list-style-type: none"> <li>• is the science (of)</li> <li>• is the branch of physics (of)</li> </ul>	<ul style="list-style-type: none"> <li>• studying natural phenomena.</li> <li>• discovering the laws of the universe.</li> <li>• making observation.</li> <li>• conducting experiments.</li> <li>• formulating laws.</li> <li>• predicting the behaviour of natural phenomena.</li> </ul>
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D) e.g. *Physics is considered to deal with various phenomena in nature.*

<ul style="list-style-type: none"> <li>• Physics</li> <li>• Chemistry</li> <li>• Astronomy</li> </ul>	<ul style="list-style-type: none"> <li>• is considered</li> <li>• is known</li> </ul>	<ul style="list-style-type: none"> <li>• to deal with</li> <li>• to study</li> <li>• to research into</li> </ul>	<ul style="list-style-type: none"> <li>• various phenomena in nature.</li> <li>• natural laws and natural forces.</li> <li>• how atoms and molecules join and separate.</li> <li>• how celestial bodies move.</li> <li>• joining and separation of atoms and molecules.</li> <li>• the movements of celestial bodies.</li> <li>• atoms and molecules and their joining and separation.</li> <li>• celestial bodies and their movements.</li> <li>• the laws of the universe that govern the behaviour of matter and energy.</li> <li>• the laws that govern the joining and separation of atoms and molecules.</li> <li>• the laws that govern the movements of celestial bodies.</li> </ul>
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✎ VII. Rewrite sentences, using

A) ‘...is / are considered to V...’ – ‘Считают, что ...’

The development of physics **has** two periods.



The development of physics **is considered to have** two periods.

Считается / Считают, что развитие физики имеет два периода.

1. Physics is one of the most ancient sciences.
2. The word “physics” takes its origin from the Greek word “phewsis” meaning nature.
3. Other sciences and technologies owe a debt to physics.
4. Classical physics comprises the period up to the beginning of the 20<sup>th</sup> century.
5. The new branches such as geophysics, biophysics, astrophysics, chemical physics, *etc.* are developed at present.
6. Every physical law is based on experiments.

## B) ‘...is / are known to V ...’ – Известно, что ...

The development of physics **has** two periods.



The development of physics **is known to have** two periods.

*Известно, что развитие физики имеет два периода.*

7. The development of other sciences and technologies depends on the knowledge of physical phenomena.
8. Astronomy studies the movements of celestial bodies.
9. The second period of the development of physics is modern.
10. The technical progress of a society is directly related to the results of physical research.
11. According to the methods of research physics is divided into two great branches.
12. Theoretical physics formulates laws and predicts the behaviour of natural phenomena.

B) ‘...is / are known to have V<sub>3</sub> ...’ – Известно, что ...

The study of physics **began** in ancient Greece.



The study of physics **is known to have begun** in ancient Greece.

*Известно, что изучение физики началось в Древней Греции.*

13. The word “physics” took its origin from the Greek word “phewsis” meaning nature.
14. Ancient philosophers attempted to understand the physical world.
15. Originally physics included all the natural sciences.
16. Quantum physics became fundamental in modern physics.

## VIII. Translate into English.

1. Считают, что физика древнейшая наука, которая изучает природные явления.
2. Известно, что физика изучает законы вселенной, управляющие поведением материи и энергии.
3. Известно, что экспериментальная физика проводит наблюдения и эксперименты, дающие нам точные знания о поведении природных явлений.
4. Считают, что технический прогресс зависит от результатов исследований.
5. Известно, что теория – это математическая конструкция, предсказывающая что-либо о физическом мире.
6. Известно, что теория относительности – это система уравнений, описывающая поведение тел в определенных условиях (under certain conditions).

## IX. Answer the questions based on the text.

1. What does the science of physics aim at?
2. When and where did the study of physics begin?
3. What does the word “physics” mean?
4. What sciences did physics include originally?
5. What does physics deal with nowadays?
6. Do other sciences and technologies owe a debt to physics? Can you give an example to prove that?
7. What period does classical /modern/ physics comprise?
8. What does experimental /theoretical/ physics deal with?
9. What fields does the science of physics include?
10. What new branches are being developed at present?

✎ X. Read the papers, title them, and then define the following terms: **matter, mass, inertial mass, gravitational mass, energy, work.**

## 1.

If physics is the study of matter, then we probably ought to define matter. Matter, in scientific terms, is anything that has mass and takes up space. So what's mass? Mass is, in simple terms, the amount of "stuff" an object is made up of.

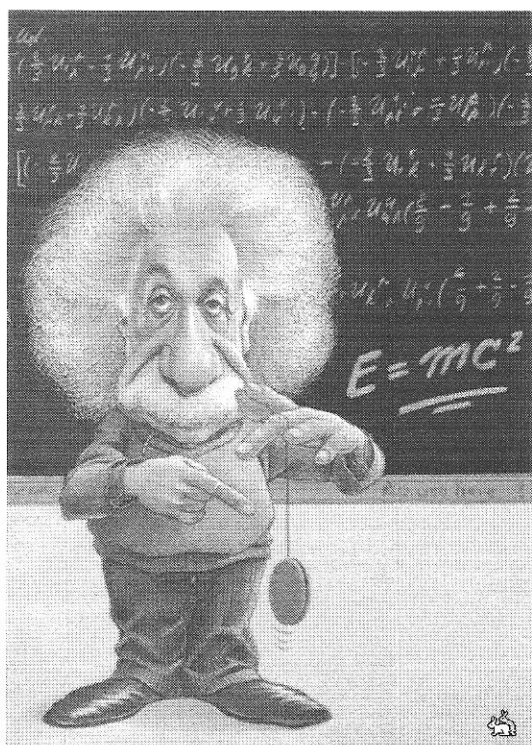
In physics, we differentiate mass into two types: inertial mass and gravitational mass. Inertial mass is an object's resistance to being accelerated by a force. More massive objects accelerate less than smaller objects given an identical force. Gravitational mass, on the other hand, relates to the amount of gravitational force experienced by an object. Objects with larger gravitational mass experience a larger gravitational force.

Confusing? Don't worry! As it turns out, inertial mass and gravitational mass have always been equal for any object measured, even if it's not immediately obvious why this is the case (although with an advanced study of Einstein's Theory of General Relativity you can predict this outcome).

In short, then, matter is anything you can touch – from objects smaller than electrons to stars hundreds of times larger than our sun. From this perspective, physics is the mother of all science. Astronomy to zoology, all other branches of science are subsets of physics, or specializations inside the larger discipline of physics.

## 2.

If it's not matter, what's left? Why, energy, of course. As energy is such an everyday term that encompasses so many areas, an accurate definition can be quite elusive. Physics texts often define energy as the ability or capacity to do work. It's a nice, brief definition, but leads to another question – what is work? Work can also be defined many ways, but let's start with the process of moving an object. If we put these two definitions together, we can vaguely define energy as the ability or capacity to move an object.



## 3.

So far, our definition of physics boils down to the study of matter, energy, and their interactions. At the turn of the 20th century, however, several physicists began proposing a strong relationship between matter and energy. Albert Einstein, in 1905, formalized this with his famous formula  $E=mc^2$ , which relates that the mass of an object, a key characteristic of matter, is really a measure of its energy. This discovery has paved the way for tremendous innovation ranging from nuclear power plants to atomic weapons to particle colliders performing research on the origins of the universe. Ultimately, if traced back to its origin, the source of all energy on the earth is the conversion of mass to energy!

XII. Add details from the text “Physics” to schemes 1.1 and 1.2 and then describe the schemes using your own words. While describing, make use of the following expressions.

The present paper deals with ... <i><b>The present paper deals with</b> the history, subject-matter, and branches of physics.</i>	Данная статья рассматривает ...
It is interesting to note that ... <i><b>It is interesting to note that</b> the study of physics began in ancient Greece.</i>	Интересно заметить, что ...
It is known that ... / ... is known to V ... <i><b>It is known that</b> the development of physics has two periods. The development of physics <b>is known to</b> have two periods.</i>	Известно, что ...
As noted in the paper ... <i><b>As noted in the paper</b> physics is broken down into classical and modern.</i>	Как отмечено в статье, ...
As the author ['ɔ:θə] notes ... <i><b>As the author notes</b> physics is divided into experimental and theoretical.</i>	Как отмечает автор, ...
As far as I know ... <i><b>As far as I know</b> experimental physics makes scientific observations and conducts experiments.</i>	Насколько я знаю ...
In my opinion the paper is ... (interesting – not interesting; useful – useless; up to date – out of date; etc.)	По моему мнению, статья ... (интересная – неинтересная; полезная – бесполезная; современная, новейшая – несовременная; и т.д.)

XIII. Write an abstract (a summary) of the text. The instructions for writing an abstract are given on pages 173 – 175.



**Stage 4 – Definitions**

From “Longman Dictionary of Scientific Usage”

**energy** The capacity to do work. There are two types of energy. **Kinetic energy** is the energy of motion of a body; it is equal to the work the body can do in coming to rest. **Potential energy** is the energy of position. For example, a body raised to a certain height above the ground has potential energy, as does a stretched spring. The potential energy is equal to the work that the body (or system) can do when it returns to its original position. Energy of moving bodies, stretched springs, *etc.*, is called mechanical energy. Other forms exist, including heat energy, electrical energy, and chemical energy. Each form of energy can be transformed into another form; transformation can only occur in the presence of *matter* (↓). The only form of energy that can exist in the absence of matter, *i.e.* in free space, is radiant energy carried by electromagnetic *waves* (→)<sup>1</sup>. Energy and mass are the two fundamental concepts of the physical world; by the relativity theory, they are interconvertible. This is the source of energy in a nuclear reactor or in an atomic bomb, called nuclear energy. In the past heat was thought to be different from mechanical energy and was measured in calories. Now all forms of energy are measured in joules.

**matter** That which occupies space at any given time and is observable or detectable, *e.g.* any object, material or organism is composed of matter; all substances, compounds and elements are matter. Matter has a structure; different types of matter have

different structures but all matter is considered to be composed of discrete particles (atoms). *The quantity* (→)<sup>2</sup> of matter may *be measured* (→)<sup>2</sup> by its mass, its volume or its amount of substance. *Gas* (↓), *liquid* (↓) and *solid* (↓) are all states of matter.

**solid Matter** (↑) with a definite volume and shape. The solid state is one of the states of matter, *e.g.* ice, glass, and coal are all solids. The structure of a solid is determined by the arrangement in space of its molecules, atoms or ions, which cannot move freely but vibrate about a fixed position. Solids are either crystalline or amorphous (including glasses or polymers).

**liquid Matter** (↑) with a definite volume but no definite shape. The liquid state is one of the states of matter, *e.g.* water and mercury at room temperature are liquids. In this state, a substance takes on the shape of the containing vessel. It is distinguished from a gas by not expanding to fill the containing vessel, *i.e.* it retains its own volume at any given temperature.

**gas Matter** (↑) with neither a definite volume nor a definite shape. The gaseous state is one of the states of matter, *e.g.* hydrogen and oxygen at room temperature are gases. In this state, a substance expands to fill the containing vessel. An amount of gas has a fixed mass, but no fixed volume; the volume changes with temperature and pressure.

<sup>1</sup> – see “THEORIES OF LIGHT” (Set B)

<sup>2</sup> – see “UNITS OF MEASUREMENT”

**Task IV. Read the definitions of the terms from “Longman Dictionary of Scientific Usage” and do the following exercises.**

➤ I. Complete the following sentences with the words from the box.

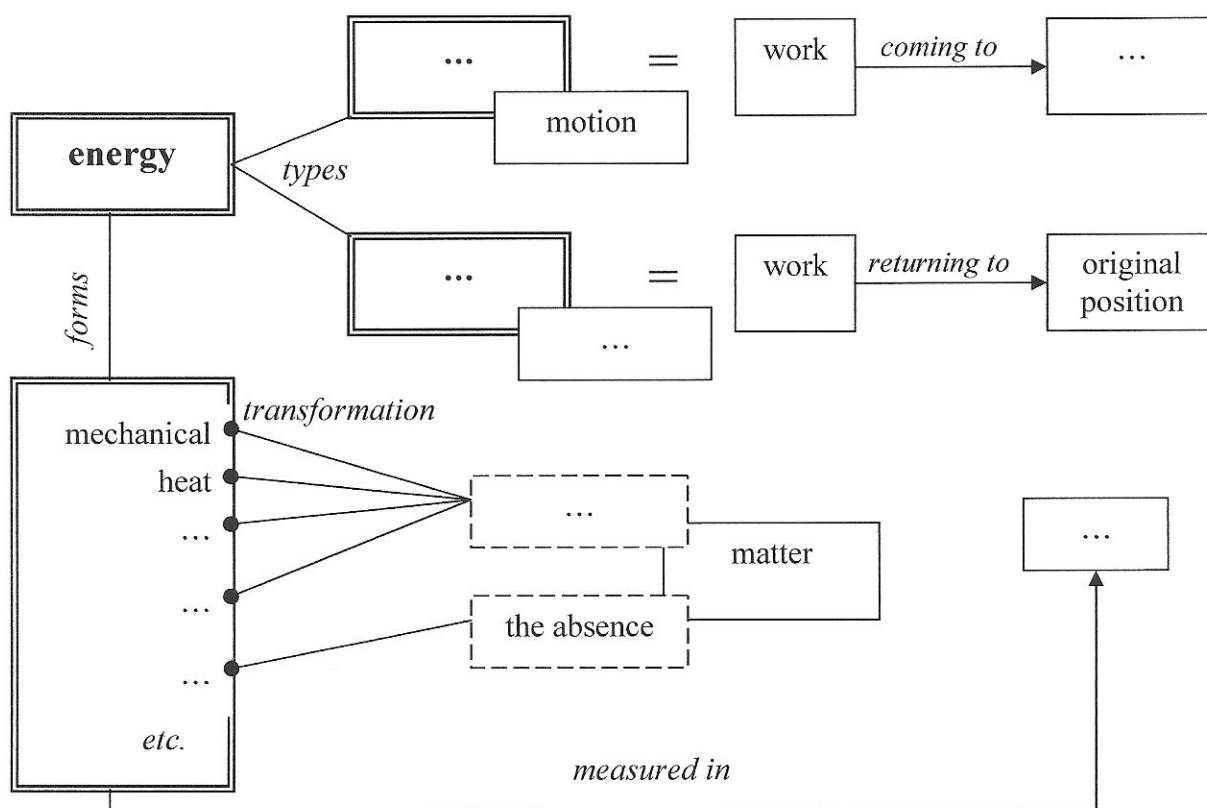
1. Water becomes a ... when it freezes.
2. A liquid is a state of matter with a definite ... and an indefinite ... .
3. There are several kinds of ... in the air.
4. The only form of ... that can exist in the absence of .... is radiant which is carried by electromagnetic waves.
5. Mercury at room temperature is a ... .

a) energy  
b) matter  
c) solid  
d) liquid  
e) gas  
f) volume  
g) shape

➤ II.

A) Complete the scheme according to the definitions.

SCHEME 1.3



B) Choose the right variant according to the scheme and then speak on energy.

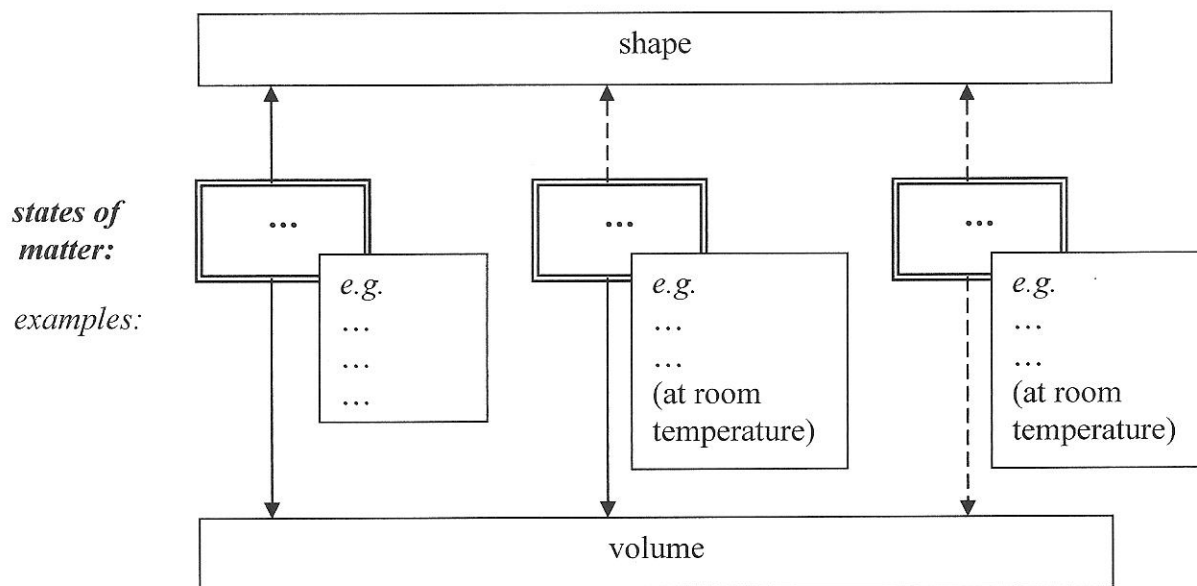
1. There are (two / four) types of energy.
2. (*Kinetic / Potential*) energy is the energy of motion of a body. It is equal to the work the body can do in (*coming to rest / returning to its original position*).
3. Potential energy is the energy of (*motion of a body / position*). It is equal to the work the body can do in (*coming to rest / returning to its original position*).
4. There are different forms of energy. They are mechanical, heat, electrical, chemical, radiant, *etc.* Each form of energy (*cannot / can*) be transformed into another.
5. Transformation can only occur in the (*presence / absence*) of matter.
6. The only form of energy that can occur in the (*presence / absence*) of matter is radiant energy.
7. Now all forms of energy are measured in (*calories / joules*).

## III.

A) Complete the scheme. Pay attention that:

the arrow  $\longrightarrow$  means “definite”  
 the arrow  $\dashrightarrow$  means “indefinite”

SCHEME 1.4

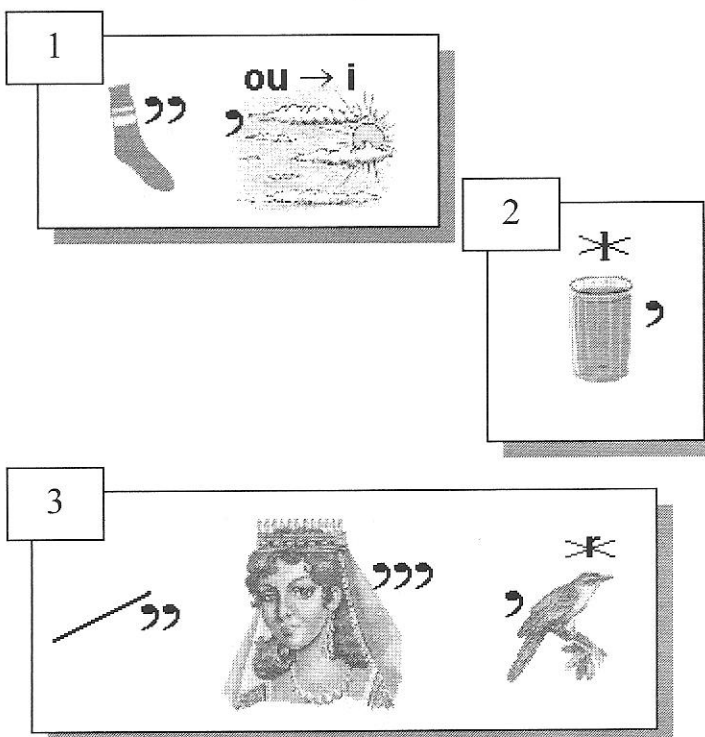


B) Complete the sentences according to the scheme and then speak on the states of matter.

1. There are ... states of matter except for plasma.
2. ... has a definite shape and a definite volume.
3. ..., ..., and ... are examples of solids.
4. ... has a definite volume and an indefinite shape.
5. Examples of liquids are ... and ... at room temperature.
6. ... has an indefinite shape and an indefinite volume.
7. ... and ... at room temperature are gases.

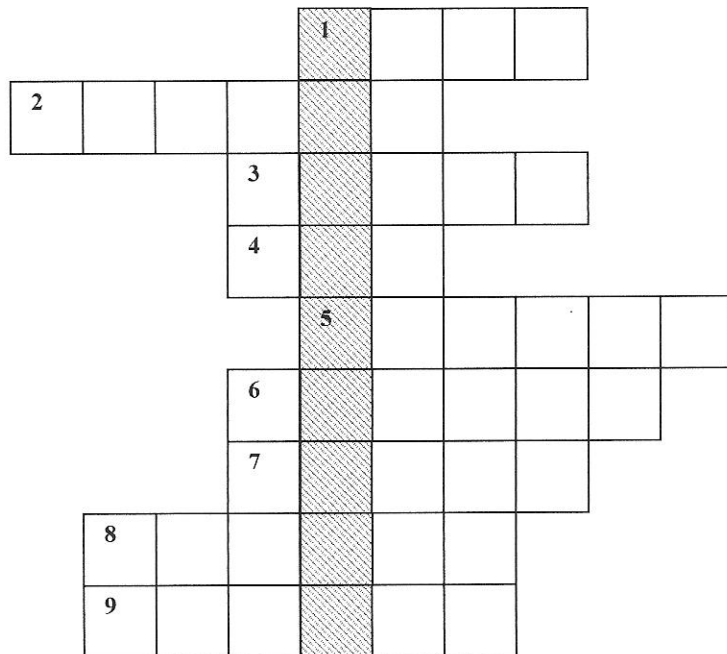
IV. **Rebuses** Solve the rebuses and then match each term with its definition.

- a) In this state, a substance takes on the shape of the containing vessel but does not expand to fill it, *i.e.* it retains its own volume at any given temperature.
- b) In this state, a substance expands to fill the containing vessel. An amount of this state of matter has a fixed mass, but no fixed volume; the volume changes with temperature and pressure.
- c) The structure of this state of matter is determined by the arrangement in space of its molecules, atoms or ions, which cannot move freely but vibrate about at fixed position.



☛ **V. Diagram** Place the terms into the diagram and a word appears in the shaded column reading down. In the language of science this word means “*the characteristic reaction produced by outside agents or by the environment on an object or substance*”. What is it?

- 1) a separate piece of matter;
- 2) the material which makes up the world and everything in space which can be seen or touched;
- 3) an area or form with a definite outline;
- 4) a type of a substance with neither a definite volume nor definite shape;
- 5) a container used especially for holding liquids;
- 6) a flowing substance like water or oil;
- 7) a state of matter with a definite volume and shape;
- 8) a measure of space occupied by a solid or a liquid, or a quantity of a substance or material contained in a vessel or container;
- 9) an ability of matter to do work.



☛ **VI. Write definitions of the terms given in the box rendering the articles below into English.**

*energy*  
*mechanical energy*

*kinetic energy*  
*potential energy*

**Энергия** – единая мера различных форм движения.

**Механическая энергия** (E) – энергия механического движения и взаимодействия тел, равная сумме кинетической ( $E_k$ ) и потенциальной ( $E_p$ ) энергий.  $E = E_k + E_p$

**Кинетическая энергия** тела – мера его механического движения. Кинетическая энергия тела равна сумме всех материальных точек, входящих в его состав / all its component material points /.

**Потенциальная энергия** – часть энергии механической системы, зависящая от конфигурации системы, т.е. от взаимного расположения частиц системы и их положения во внешнем силовом поле.

**Task V. What else would you like to know about Physics? Work in groups and write some questions. Think of:**

- ☐ The History of Physics
- ☐ Energy
- ☐ Matter
- ☐ Classical and Modern Physics
- ☐ Theoretical and Experimental Physics
- ☐ Fields of Physics

**Choose one of the questions you wrote and research the answer. You could use the Internet or an encyclopedia. Make a poster for your classroom wall and present it in the class.**