Unit Two

PHYSICS

READING PASSAGE

Physics and scopes of Physics

Physics is the major science dealing with the fundamental constituents of the universe, the forces they exert on one another, and the results produced by these forces. Sometimes in modern physics a more sophisticated approach is taken that incorporates elements of the three areas listed above; it relates to the laws of symmetry and conservation, such as those pertaining to energy, momentum, charge, and parity.

Physics is closely related to the other natural sciences and, in a sense, encompasses them. Chemistry, for example, deals with the interaction of atoms to form molecules; much of

modern geology is largely a study of the physics of the earth and is known as geophysics; and astronomy deals with the physics of the stars and outer space. Even living systems are made up of fundamental particles and, as studied in biophysics and biochemistry, they follow the same types of laws as the simpler particles traditionally studied by a physicist.

The emphasis on the interaction between particles in modern physics, known as the microscopic approach, must often be supplemented by a macroscopic approach that deals with larger elements or systems of particles. This macroscopic approach is indispensable to the application of physics to much of modern technology. Thermodynamics, for example, a branch of physics developed during the 19th century, deals with the elucidation and measurement of properties of a system as a whole and remains useful in other fields of physics; it also forms the basis of much of chemical and mechanical engineering. Such properties as the temperature, pressure, and volume of a gas have no meaning for an individual atom or molecule; these thermodynamic concepts can only be applied directly to a very large system of such particles. A bridge exists, however, between the microscopic and macroscopic approach; another branch of physics, known as statistical mechanics, indicates how pressure and temperature can be related to the motion of atoms and molecules on a statistical basis.

Physics emerged as a separate science only in the early 19th century; until that time a physicist was often also a mathematician, philosopher, chemist, biologist, engineer, or even primarily a political leader or artist. Today the field has grown to such an extent that with few exceptions modern physicists have to limit their attention to one or two branches of the science. Once the fundamental aspects of a new field are discovered and understood, they become the domain of engineers and other applied scientists. The 19th-century discoveries in electricity and magnetism, for example, are now the province of electrical and communication engineers; the properties of matter discovered at the beginning of the 20th century have been applied in electronics; and the discoveries of nuclear physics, most of them not yet 40 years old, have passed into the hands of nuclear engineers for applications to peaceful or military uses.

(*From* **http://encarta.com**)

COMPREHENSION QUESTION

Exercise 1: *Answer the following questions by referring to the reading passage*.

1. What does physics study in general?

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2. What is an approach in modern physics related to?

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3. Are there any relations between physics and other sciences? Give some illustrations.

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4. What does statistical physics show?

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5. When was physics seen as a separate science?

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Exercise 2: *Complete each of the following statements with words/ phrases from the reading passage*

1. Physics …….. the fundamental constituents of the universe
2. … a more sophisticated approach ……..elements of the three areas...
3. It relates to the laws of …….. and conservation
4. Physics is closely related to the other natural ……..
5. Chemistry deals with the …….. of atoms to form molecules
6. Even living systems are made up of …….. particles
7. The emphasis on the interaction between particles in modern physics, known as the …….. approach
8. This macroscopic approach is …….. to the application of physics
9. these thermodynamic concepts can only be applied ……..to a very large system of such particles
10. A bridge exists, ……..,between the microscopic and macroscopic approach

Exercise 3: *Decide whether each of the following statements is true (T), false (F) or with no information to clarify (N).*

1. ……..Modern physics also deals with the fundamental constituents of the universe.
2. ……..There are relations between physics and other natural sciences.
3. ……..The microscopic approach is more important than the macroscopic one.
4. ……..The macroscopic is unnecessary to the application of physics to much of modern technology.

5. ……..Thermodynamics deals with the measurement of properties of a system as an individual.
6. ……..*Statistical* mechanics shows the way in which pressure and temperature are related to each other.
7. ……..Before the 19th century, people had had no ideas of what physics was like.
8. ……..Many people studied physics because it was interesting.
9. ……..Today, physics has become the most important science.
10. ……..Nuclear physics was originally for peaceful purposes.

GRAMMAR IN USE

I) Participle phrases replacing relative clauses

1. Participles of verbs

In English, each verb has two participles: $\begin{cases} participleI(PI) = verb\_ing \\ ParticipleII(PII) = verb\_ed \end{cases}$

In which the former is considered the active participle and the second is known as passive particle.

A participle phrase is the one with the centre element being a participle.

Example:

1. **working** with me
2. **studying** Physics last year
3. **written** by a famous scientist
4. **clarified** by the International Bureau of Weights and Measures
5. *having been* carefully **conducted** in the laboratory
6. *being* **considered** by the Government

II) Participles replacing relative clauses

From the above mentioned, it is deduced that each type of participle, therefore, will replace a corresponding relative clause with the same grammatical implication (whether passive or active), basing on the form of the verb phrase in the relative clause.

Consider the following examples (from **Unit one**)

1. Science (pure science) is a term <u>which is used to denote systemized knowledge in any field.</u>

2. Applied science is the term that is used to refer to the search for practical uses of scientific knowledge.
3. Neil Armstrong was the first person who walked on the Moon.
4. Here, we should distinguish pure science from technology through which applications are realized.
5. Newton whom many of us, scientists have respected used not to be a good student at all.
6. Newton, whose discovery of the theory of gravity was very strange, has been the pioneer in Mechanics Physics.

It is clearly seen that half of the above examples of relative clauses are active (3, 5, 6) and the other half are passive (1, 2, 4).

However, not all relative clauses but the ones with relative pronoun in subject position can be replaced with participle phrases. This is applicable to both types of relative clauses. Hence, among the above relative clauses, only the first three can be replaced.

We have:

1. Science (pure science) is a term used to denote systemized knowledge in any field.
2. Applied science is the term used to refer to the search for practical uses of scientific knowledge.
3. Neil Armstrong was the first person walking on the Moon.*

These sentences will be interpreted basing on the context in which it appears:

As in the first two participle phrases, they are used to make definitions so the verbs in the corresponding relative clauses must be in present tense while, in the last one, the tense of verb in the corresponding relative clause must be the simple past tense (it is the action of the past).

Note

- The third case of relative clause can be replaced with a to- infinitive (refer to **Unit eleven-Volumn 2**).
- Relative clauses with intransitive verbs can not be replaced with –ed phrase.

PRACTICE

Replace the relative clause in each of the following sentences with its corresponding participle phrase if possible.

1. Another scale which employs absolute zero as its lowest point is the Rankine scale, in which each degree of temperature is equivalent to one degree on the Fahrenheit scale.

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2. Democritus formulated a concept that has guided physics at various times ever since- the search for the basic building blocks of the universe and the forces that determine their behavior.

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3. Einstein's genius, which is characterized equally by logical clarity and creative imagination, succeeded in remolding and widening the imposing edifice whose foundations had been laid by Newton's great work.

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4. Field (physics) is the area that surrounds an object, in which a gravitational or electromagnetic force is exerted on other objects.

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5. Galileo's astronomical discoveries and his work in mechanics foreshadowed the work of the 17th-century English mathematician and physicist Sir Isaac Newton, one of the greatest scientists who ever lived.

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6. German astronomer Johannes Kepler, who was born in 1571, is a key figure in the history of physics.

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7. In the next millennium, physicists may achieve a single overarching theory that explains how the four fundamental forces in the universe can be unified.

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8. Mankind will always be indebted to Einstein for the removal of the obstacles to our outlook which were involved in the primitive notions of absolute space and time.

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9. Newton stated his ideas in several published works, two of which, *Philosophiae Naturalis Principia Mathematica* (Mathematical Principles of Natural Philosophy, 1687) and *Opticks* (1704), are considered among the greatest scientific works ever produced.

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10. Newton, Sir Isaac (1642-1727), who is considered one of the most important scientists of all time, is an English physicist, mathematician, and natural philosopher.

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11. No other half-century in history has witnessed so revolutionary a transformation in man's view of the nature of the physical universe as the one through which we have just passed.

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12. Over the last 1,000 years the science of physics has enabled us to probe and understand the world of the very large-the stars and the galaxies that contain them-and, more recently, the world of the very small-the fundamental particles that make up matter and the forces that govern their interactions.

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13. Physicists believe the universe began about 12 billion years ago in a cosmic explosion which is known as the big bang, when a magnificent dowry of energy appeared and converted to particles of matter.

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14. Physicists have also identified the four fundamental forces that govern the interactions between elementary particles.

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15. The Babylonians, Egyptians, and early Mesoamericans observed the motions of the planets and succeeded in predicting eclipses, but they failed to find an underlying system that governs planetary motion.

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16. The English Scholastic philosopher and scientist Roger Bacon was one of the few philosophers who advocated the experimental method as the true foundation of scientific knowledge and who also did some work in astronomy, chemistry, optics, and machine design.

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17. The same spirit that characterized Einstein's unique scientific achievements also marked his attitude in all human relations.

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18. The sensation of warmth or coldness of a substance on contact is determined by the property which is known as temperature.

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19. We are missing lots of details about this original hot, tiny universe, in which space was expanding and rushing outward and particles were clustering and eventually binding.

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20. With the death of Albert Einstein, a life in the service of science and humanity which was as rich and fruitful as any in the whole history of our culture has come to an end.

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PROBLEM SOLVING

I) Reading complex formulae

1) Refer to appendix 6 for Greek letters and their pronunciation

2) What do the following symbols mean in English?

1. ≡ 2. ≠ 3. ≅ 4. → 5. < 6. >

7. ≤ 8. ≥ 9. ∝ 10. ∞ 11. ± 12. ∴

3) Read out the following expressions

1. $f = \dfrac{1}{2\Pi\sqrt{LC}}$ 2. $E = \delta T^4$

3. $W_s = \dfrac{2\pi f}{P}$ 4. $y = \dfrac{W_0}{4\pi R}F$

5. $\mu_0 = 4\pi \times 10^{-7}\, Hm^{-1}$ 6. $C = \dfrac{L}{R^2 + \varpi^2 L^2}$

7. $v_2 = \sqrt{\left(\dfrac{2e}{m}V_2\right)}$ 8. $u = \dfrac{\frac{1}{2}\sigma_v^2}{K}$

9. $\sigma = \dfrac{Myc}{I} + \dfrac{P}{A}$ 10. $y = \dfrac{4Q}{3\pi R^2}\left(R^2 - y^2\right)$

II) Adjectives order

1) It is obvious that words appear in sentences/ statements/ utterances in a linear order. However, each language has its own way of ordering the words for communicative purposes, it is, then, very important to understand this.

In English, the very difference in word order from that in Vietnamese is the order of adjectives: In English, adjectives go before nouns to modify nouns regardless of some exceptions while it is opposite in Vietnamese. For example:

English: a *successful* experiment → **Vietnamese**: một thí nghiệm *thành công*

And we have more than one type of adjectives and sometimes a group of adjectives at the same time modify one noun; that is why we have to clarify which type of adjective should go first, and which last.

English adjectives have the following normal rule of positioning:

size – general description – age – shape – colour – material – origin – purpose – participle----**Noun**