

## Unit 1 Writing - Terms, Class Words, and Characteristics

**Note:** Read pages 69, 70, and 71 in *English for Science* and complete the exercise on the top of page 71 before beginning these exercises.

Definition formula:

$$\text{Term} = \text{Class} + \text{Characteristics}$$

In the formula above, '**term**' refers to the **word** that is being defined, '**class**' refers to the **group** that the term belongs to, and '**characteristics**' refers to the **properties** of the term **that differentiate it from others** in its class.

### characteristics

كلمة واحدة، شبه جملة، فقرة.

**Characteristics:** (الصفات، المميزات)

Characteristics may be **one-word** adjectives, adjective **phrases**, adjective **clauses** (relative clauses), or a **combination** of them.

- **One-word** adjectives are words that are complete in **one word**.
- Adjective **phrases** and **clauses** are **groups of words** that cannot be broken down into one-word adjectives.
- **One-word** adjectives are placed **before** class words in formal definitions.
- Adjective **phrases** and **clauses** are placed **after** class words in formal definition sentences.

**Examples:**

Term                      Characteristics                      Class Word  
 ↓                                      ↓                                      ↓  
 A macronucleus is a **large, dense nucleus**. (one-word adjectives placed before the class word)

Term                      Class Word                      Characteristics  
 ↓                                      ↓                                      ↓  
Biology is the Study **of living things**. (adjective phrase placed after the class word)

Term                      Class Word                      Characteristics  
 ↓                                      ↓                                      ↓  
Einstein was a scientist **who studied energy**. (adjective clause placed after the class word)

**Note:** Dictionary definitions for terms should always provide characteristics that **completely differentiate** the term from others in its class. However, the characteristics provided in readings generally do **not** provide enough information to differentiate completely. Definitions from context must provide characteristics that are **true**, but not characteristics that **completely differentiate**.

إذا ابتسم المهزوم فقد المنتصر لذة الفوز.

## Classification Definitions (Specific Definitions)

A classification definition is a statement in which the class word is part of the term.

A classification definition is also called a **specific definition** because it defines a specific type of item instead of a general item. Consider the two examples given below:

- (i) A saw is a **tool** used for cutting wood.
- (ii) A key-hole saw is a **saw** with a thin, narrow blade.

The first example is a **formal definition sentence** which is a **general** statement about a saw (any saw-- **not** a specific kind of saw), but the second example is a **classification definition sentence** because it defines a special kind of saw.

A. For each classification definition, underline the term and circle the class word. Note that the class word for a classification definition is part of the term. [The class word for a formal definition that is **not** a classification definition should not repeat any part of the term. If any part of the **term** is repeated in a **formal** definition sentence, then the definition is **incorrect**, and it is called a **circular definition**.

1. Kinetic energy is the energy of motion.
2. Technical dictionaries are dictionaries that define scientific terms.
3. Boiling water is water that has reached a temperature of 100° Celsius.
4. An equilateral triangle is a triangle with three equal sides.
5. A clinical thermometer is a thermometer used for measuring a person's body temperature.

في  
**Classification Definition**  
لا بد أن يكون الـ class جزء  
من الـ term

**Relative Pronouns** are words that begin the characteristics in a formal / classification definition sentence. They are also called **clause markers** because they begin an adjective /relative clause (p.28).

B. Use the **relative pronouns** in the box to complete the **formal or classification definitions** given below. Each answer should be used only once.

that    where    which    who    whose  
by which    during which    in which    from which

1. Fission is a chain reaction **that** takes place very rapidly.
2. The center of the sun is a place **where** fusion takes place.
3. Einstein was a scientist **who** wrote a famous equation.
4. Einstein was the scientist **whose** famous equation  $E = mc^2$  expresses the law of the conservation of matter and energy.
5. The law of the conservation of matter is a law **which** states that matter can be converted from one form to another but can be neither created nor destroyed.
6. Burning is a process **during which** matter is neither created nor destroyed. (Matter is neither created nor destroyed **during** the process of burning.)
7. Digestion is the process **by which** chemical energy is released from food. (Chemical energy is released from food by the process of digestion.)
8. Hydrogen atoms are atoms **from which** helium atoms are created. (Helium atoms are created **from** hydrogen atoms.)
9. France is the country **in which** Antoine Lavoisier lived. (Antoine Lavoisier lived **in** France.)

الكلمة	المعنى
law	قانون
digestion	هضم
conservation	حفظ
express	يعبر عن

لا تصنعن لنفسك معبراً في النهر  
ثم تجاهد بعد ذلك لتجمع أجره.

## Rules for Writing Formal Definition Sentences

- 1.1) Formal definition sentences **cannot** be **compound sentences**. Formal definition sentences must be written in the same format as shown on page 45 (Unit 1) and as shown on pages 69, 70, and 71 (English for Science).

Incorrect: A machine is a device, **and it transforms energy from one form to another.**  
Correct: A machine is a device **that transforms energy from one form to another**

- 1.2) Formal definition sentences must be **simple** or **complex** sentences

Incorrect: A knife is a tool, **and it is used to cut things** (compound)  
Correct: A knife is a tool used to cut things. (simple)  
Correct: A knife is a tool which is used to cut things (complex)

قواعد كتابة التعريفات  
الثمانية

- 2) Formal definition sentences **cannot** be **circular**.

Incorrect: Tungsten steels are alloys **that contain tungsten.**  
Correct: Tungsten steels are alloys that are used to make tools.

Note: The **class word** for a **classification** definition may be **repeated from the term**.

The example given above may be written as a classification definition as:

Tungsten steels are **steels** that are used to make tools.

Here '**steels**' is the class word which is repeated from the term "tungsten steels."

However, if the **term** or any part of the term is used as **class word** in a **formal definition sentence**, the definition is **circular** and therefore **incorrect** as shown in the example below:

Incorrect: Dogs are **dogs** that bark.  
Correct: Dogs are **animals** that bark.

- 3) **Characteristics cannot be examples** (but examples may be added after characteristics).

Incorrect: Dogs are animals **such as police dogs.**  
Correct: Dogs are animals **that may be used as workers**, such as police dogs.

- 4) **Characteristics cannot be negative**.

Incorrect: Dogs are animals **that do not have eight legs.**  
Correct: Dogs are animals **that have four legs.**

- 5) **Characteristics cannot** define the **class word**. **Characteristics** must define the **term**.

Incorrect: Sharks are fish **that swim.** (This is for defining fish, not sharks.)  
Incorrect: Jets are airplanes **that fly.** (This is for defining airplanes, not jets.)

Correct: Sharks are **very large sea** fish that can attack people swimming near them.  
Correct: Sharks are **animals that swim.** (This is not for defining animals, so it is okay.)

Correct: Jets are **extremely fast** airplanes.  
Correct: Jets are **vehicles that fly.** (This is not for defining vehicles, so it is okay.)

- 6) Contractions **cannot** be used in technical English writing.

Incorrect: **it's** Correct: it is

Incorrect: **isn't**  
Correct: is not

لا تنسب أفكار الآخرين  
إلى نفسك.

7) Personal pronouns **cannot** be used in technical English writing.

Incorrect: we, he, you  
Correct: it / they

8) While writing definitions from context, **do not include any information that is not given in the reading passage context) and do not include your personal feelings - be objective.** Use **only** the information given in the passage to write formal definition sentences.

C. For each defined term, **circle the class word** and **underline the characteristics**. Then circle the answer that best describes the form of the **characteristics**.

1. **Potential energy** is stored **energy**.

a) **one-word adjective(s)** b) prepositional phrase c) infinitive phrase d) participial phrase e) relative clause

2. **Digestion** is the **process** by which food is broken down.

a) one-word adjective(s) b) prepositional phrase c) infinitive phrase d) participial phrase e) **relative clause**

Note that class words are usually indefinite, but here 'process' is definite.  
The words 'by which food is broken down' are the reason that 'process' is definite (explained).  
If we remove **by which food is broken down**, then the correct sentence is: Digestion is **a process**.

3. **Energy** is the **ability** to do work. [definite class word (explained)]

a) one-word adjective(s) b) prepositional phrase c) **infinitive phrase** d) participial phrase e) relative clause

4. **Mechanical energy** is **energy** related to the movement of objects.

a) one-word adjective(s) b) prepositional phrase c) infinitive phrase d) **participial phrase** e) relative clause

5. An **astronomer** is a **scientist** who studies the universe.

a) one-word adjective(s) b) prepositional phrase c) infinitive phrase d) participial phrase e) **relative clause**

6. **Water** is a **compound** consisting of two different elements.

a) one-word adjective(s) b) prepositional phrase c) infinitive phrase d) **participial phrase** e) relative clause

7. **Aluminum** is a **metal** that resists corrosion.

a) one-word adjective(s) b) prepositional phrase c) infinitive phrase d) participial phrase e) **relative clause**

8. **A meter** is a **unit** for measuring distance.

a) one-word adjective(s) b) **prepositional phrase** c) infinitive phrase d) participial phrase e) relative clause

9. **Triangles** are three-sided **figures**.

a) **one-word adjective(s)** b) prepositional phrase c) infinitive phrase d) participial phrase e) relative clause

10. **A laboratory** is a **place** where experiments are performed.

a) one-word adjective(s) b) prepositional phrase c) infinitive phrase d) participial phrase e) **relative clause**

11. **Conduction** is a **process** by which heat is transferred.

a) one-word adjective(s) b) prepositional phrase c) infinitive phrase d) participial phrase e) **relative clause**

12. A **giraffe** is an **animal** whose neck grows to a length of about 2.5 meters.

a) one-word adjective(s) b) prepositional phrase c) infinitive phrase d) participial phrase e) **relative clause**

من الإنسانية ألا يتم التضحية بإنسان في سبيل غاية.

## Singular, Plural, and Uncountable Formal Definitions

D. For each definition, **circle** the **main** verb and **underline** the **articles**. Then indicate whether the defined term is singular (S), plural (P), or uncountable (U).

1. S A school is a place where children learn to read and write.
2. P Schools are places where children learn to read and write.
3. U Aluminum is a metal that is produced from bauxite.
4. P Dentists are professional people who take care of people's teeth.
5. S An airplane is a vehicle that can fly.
6. U Gravity is a force of attraction between bodies of matter.
7. U Thermal energy is the kinetic energy of molecules. [explained]

E. Change each of these **singular** definitions to **plural** definitions.

1. A biologist is a scientist who studies living organisms.

**Biologists are scientists who study living organisms.**

2. A knife is a tool that is used to cut things. [one knife - two knives]

**Knives are tools that are used to cut things.**

3. A store is a place where things are sold.

**Stores are places where things are sold.**

4. A scale is a device that measures weight.

**Scales are devices that measure weight.**

F. Change each of these **plural** definitions to **singular** definitions

1. Hammers are tools that are used for pounding.

**A hammer is a tool that is used for pounding.**

2. Fans are devices that circulate air.

**A fan is a device that circulates air.**

3. Bees are insects that produce honey.

**A bee is an insect that produces honey.**

4. Pens are writing instruments that contain ink.

**A pen is a writing instrument that contains ink.**

الكلمة	المعنى
produce	ينتج
vehicle	مركبة
attraction	تجاذب
explain	يوضح
organism	كائن حي
biology	علم الأحياء
measure	يقيس
pounding	الضرب، السحق
fan	مروحة
circulate	يُدور، يُدور
instrument	أداة، وسيلة

من علو أخلاقك أن تمنح معارضك  
فرصة جيدة للانسحاب دون إحراجك.

## Writing Formal Definitions

G. Use **relative pronouns** from the box and **combine the given sentences** to write **formal definitions**. Change class words to definite if necessary [explained].

that    where    which    who    whose by which    during which    in which    from which
--

1. The law of the conservation of matter is a law. This law states that there is no gain or loss of mass in a chemical change.

The law of the conservation of matter is a law which states that there is no gain or loss of mass in a chemical change.

2. Einstein was a scientist. His ideas led to the production of an atomic bomb.

Einstein was a scientist whose ideas led to the production of an atomic bomb.

3. France is a country. France is where Lavoisier was born. [definite - explained]

France is the country where Lavoisier was born.

4. Fusion is a process. Hydrogen is transformed into helium by fusion. [definite - explained]

Fusion is the process by which hydrogen is transformed into helium.

5. Einstein was a scientist. He believed that matter could be changed into energy.

Einstein was a scientist who believed that matter could be changed into energy.

6. A chain reaction is a process. A huge amount of energy is released during this process.

A chain reaction is the process during which a huge amount of energy is released.

7. Enzymes are substances in the human body. They release the energy stored in food molecules.

Enzymes are substances in the human body that release the energy stored in food.

إذا لم تخطط لأهدافك، فليس من حقاك  
أن تندم على عدم تحقيقها.

## Formal Definitions from Context

Use the following reading to answer the questions given below.

<sup>1</sup>A **fuel** is a material that provides useful energy. <sup>2</sup>Fuels are used to heat and cool buildings, cook food, power engines, and produce electricity. <sup>3</sup>Some fuels occur naturally, and others are artificially created. <sup>4</sup>Such **natural fuels** as **coal**, petroleum, and natural gas are obtained from underground deposits that were formed millions of years ago from the remains of plants and animals. <sup>5</sup>These fuels, which are called fossil fuels, account for about 90 percent of the energy people use today.

<sup>6</sup>**Synthetic fuels** are artificially produced and can be made from fossil fuels, certain types of rock and sand, and biomass. <sup>7</sup>Biomass is the name given to such replaceable organic matter as **wood**, garbage, and animal manure that can be used to produce fuel. <sup>8</sup>Chemicals are used to make some other synthetic fuels.

<sup>9</sup>Most fuels release energy by burning with oxygen in the air. <sup>10</sup>However, some - especially chemical fuels used in rockets -- need special oxidizers in order to burn. <sup>11</sup>Oxidizers are compounds that contain oxygen. <sup>12</sup>Nuclear fuels do not burn but release energy through the fission or fusion of atoms.

### H. Write your answers (a, b, c, or d) on the blanks provided.

1. Correct formal definition sentences for **fuels** (plural) include  b .

- A fuel is a material that provides useful energy.
- Fuels are materials that provide useful energy.**
- Fuels are a materials that is used to heat and cool buildings, cook food, power engines and produce electricity.
- all of the above

الكلمة	المعنى
<b>provide</b>	يزود، يمد
<b>naturally</b>	طبيعياً
<b>artificially</b>	صناعياً
<b>deposits</b>	رواسب
<b>remains</b>	بقايا
<b>account</b>	تمثل

2. Correct formal definition sentences for **fuel** include  c .

- A fuel is a material that occurs naturally and is artificially created.
- A fuel is a material that occurs naturally.
- A fuel is a material which may occur naturally or which may be artificially created.**
- all of the above

3. Correct formal classification definition sentences for **natural fuel** (singular) include  d .

- A natural fuel is obtained from underground deposits.
- A natural fuel is formed millions of years ago from the remains of plants and animals.
- A natural fuel was formed millions of years ago from the remains of plants and animals.
- none of the above**

4. Correct formal definition sentences for **coal** include  c .

- Coal is a natural fuel that is artificially created.
- Coal is a natural fuel that is formed millions of years ago.
- Coal is a natural fuel that is obtained from underground deposits.**
- none of the above

5. Correct formal classification definition sentences for **synthetic fuels** include  d .

- Synthetic fuels are fuels that are artificially created.
- Synthetic fuels are fuels that can be made from fossil fuels, certain types of rock and sand, biomass, or chemicals.
- Synthetic fuels are fuels which are artificially created and which can be made from fossil fuels, certain types of rock and sand, biomass, or chemicals.
- all of the above**

6. Correct formal definition sentences for **wood** include  a .

- Wood is replaceable organic matter that can be used to produce fuel.**
- Wood is such replaceable organic matter as that can be used to produce fuel.
- Wood are such replaceable organic matter as that can be used to produce fuel.
- all of the above

الأمر ببساطة: إن أهم سبب لعدم تحقيق الأهداف هي عدم وجودها.

**Formal Definitions from Context continued...**

1A fuel is a material that provides useful energy. 2Fuels are used to heat and cool buildings, cook food, power engines, and produce electricity. 3Some fuels occur naturally, and others are artificially created. 4Such natural fuels as coal, petroleum, and natural gas are obtained from underground deposits that were formed millions of years ago from the remains of plants and animals. 5These fuels, which are called **fossil fuels**, account for about 90 percent of the energy people use today.

6Synthetic fuels are artificially produced and can be made from fossil fuels, certain types of rock and sand, and biomass. 7**Biomass** is the name given to such replaceable organic matter as wood, garbage, and animal manure that can be used to produce fuel. 8Chemicals are used to make some other synthetic fuels.

9Most fuels release energy by burning with oxygen in the air. 10However, some -- especially **chemical fuels** used in rockets -- need special **oxidizers** in order to burn. 11Oxidizers are compounds that contain oxygen. 12Nuclear fuels do not burn but release energy through the fission or fusion of atoms.

7. Correct formal classification definition sentences for **chemical fuel** (singular) include d.

- a) A chemical fuel is a fuel that is only used in rockets.
- b) A chemical fuel is a fuel that always needs a special oxidizer to burn.
- c) A chemical fuel is synthetic.
- d) **none of the above**

8. Correct formal classification definitions for **nuclear fuel** (singular) include d.

- a) A nuclear fuel does not burn.
- b) A nuclear fuel is a fuel that does not burn.
- c) Nuclear fuels are fuels that do not burn.
- d) **none of the above**

I. For each of the terms below, use information from the reading to write two (or more if necessary) formal definition sentences.

الكلمة	المعنى
biomass	كتلة حيوية
replaceable	يمكن تحويله
synthetic	صناعي
oxidizer	عامل مؤكسد

1 a. **fossil fuel** (singular / classification)

A fossil fuel is a natural fuel.

1 b. **fossil fuel** (singular / classification)

~~A fossil fuel is a natural fuel that accounts for about 90 percent of the energy people use to today.~~

[The plural definition is true, but the singular definition is false because one fossil fuel cannot account for 90%.]

1 c. **fossil fuel** (singular / classification)

A fossil fuel is a natural fuel that is obtained from underground deposits.

A fossil fuel is a fuel that was formed millions of years ago.

1 d. **fossil fuel** (singular / classification)

A fossil fuel is a natural fuel that can be used for producing synthetic fuels.

A fossil fuel is a fuel from which a synthetic fuel is made.

1 e. **fossil fuels** (plural / classification)

Fossil fuels are natural fuels that are obtained from underground deposits.

من علت همته، طال همته.

### Formal Definitions from Context continued...

<sup>1</sup>A fuel is a material that provides useful energy. <sup>2</sup>Fuels are used to heat and cool buildings, cook food, power engines, and produce electricity. <sup>3</sup>Some fuels occur naturally, and others are artificially created. <sup>4</sup>Such natural fuels as coal, petroleum, and natural gas are obtained from underground deposits that were formed millions of years ago from the remains of plants and animals. <sup>5</sup>These fuels, which are called fossil fuels, account for about 90 percent of the energy people use today.

<sup>6</sup>Synthetic fuels are artificially produced and can be made from fossil fuels, certain types of rock and sand, and biomass. <sup>7</sup>**Biomass** is the name given to such replaceable organic matter as wood, garbage, and animal manure that can be used to produce fuel. <sup>8</sup>Chemicals are used to make some other synthetic fuels.

<sup>9</sup>Most fuels release energy by burning with oxygen in the air. <sup>10</sup>However, some -- especially **chemical fuels** used in rockets -- need special **oxidizers** in order to burn. <sup>11</sup>Oxidizers are compounds that contain oxygen. <sup>12</sup>Nuclear fuels do not burn but release energy through the fission or fusion of atoms.

**2a. biomass** Biomass is a replaceable organic matter that can be used to produce fuel.

**2b. biomass** Biomass is the name given to some replaceable organic matter.

Biomass is an organic matter that can be used to produce synthetic fuels.

**3a. chemical fuel (singular/ classification)**

A chemical fuel is a fuel that is artificially produced.

A Chemical fuel is a fuel that may need special oxidizer to burn.

**3b. chemical fuel (singular/classification with a correct verb modal)**

A chemical fuel is a fuel that can be artificially created or can be made from fossil fuels.

A chemical fuel is a fuel that can be used in rockets.

**3c. chemical fuels (plural/classification with a correct verb modal)**

Chemical fuels are fuels that can be artificially created or can be made from fossil fuels.

**4a. oxidizer (singular)**

An oxidizer is a compound that contains oxygen.

**4b. oxidizer (singular)**

An oxidizer is a compound that is used to burn a chemical fuel.

البعض يسافر ليس ليصل بل لمجرد السفر، أغلبنا يعاني من أجل لا شيء.

### Formal Definitions from Context

The first thermometer was invented by Galileo in 1593. It was called a **thermo scope**, but it was not very accurate. In 1641, an accurate thermometer using alcohol was produced. The first mercury thermometer was developed in 1714 by German physicist, **G.D. Fahrenheit**.

A thermometer is an instrument that measures the temperature of solids, liquids, and gases. There are four types of thermometers: liquid-in-glass, deformation-type, electrical, and digital.

Liquid-in-glass thermometers use either **mercury** or alcohol. Alcohol is used in places where the temperature often drops below the freezing point of mercury, which is - 39°C. The liquid partly fills a sealed glass tube. When the temperature rises, the liquid expands and moves up the tube, which is fixed to a temperature scale.

**Deformation-type thermometers** change shape as the temperature changes. Bimetallic thermometers are a good example. They consist of two strips of different metals, such as brass and steel, which are fastened together. When the temperature rises, each metal expands at a different rate. This causes the strip to bend and moves a pointer attached to the strips across a temperature scale. A **thermograph** is a bimetallic thermometer with a pen attached which makes a written record of the temperature changes.

Resistance thermometers are electrical thermometers. They are made of copper, nickel, or platinum. A change in temperature makes the electrical resistance of these metals (to) vary. The variation is measured and indicated on a temperature scale. Platinum resistance thermometers are the most accurate thermometers. They are used to check the accuracy of all other types of thermometers.

Digital thermometers are resistance thermometers that show the temperature in numbers (digits) in a display **window**. They measure temperature by means of a slender device called a **probe**. The probe is either made of a metal, such as platinum, or a semiconductor. As the temperature changes, so does the electrical resistance of the probe. The probe sends electrical signals to an electric circuit which changes the signals into numbers that are shown in the display unit.

J. Use information from the reading above to write formal or classification definition sentences for the following:

a. **thermographs:**

Thermographs are bimetallic thermometers with pens attached which make a written record of the temperature changes.

الكلمة	المعنى
invent	يخترع
accurate	دقيق
mercury	زئبق
develop	يطور

b. **thermo scope:**

A thermo scope is the thermometer that was invented by Galileo.

c. **deformation-type thermometer:**

Deformation-type thermometer is a thermometer that changes shape as the temperature changes.

d. **probe:**

A probe is a slender device that is used to measure temperature.

الكلمة	المعنى
sealed	مُدْرَج
expand	يتمدد
strip	شريحة
resistance	مقاومة
digital	رقمي
signal	إشارة

e. **display window:**

A display window is the part of a digital thermometer that shows the temperature in numbers.

f. **mercury:**

Mercury is the liquid that is used in liquid thermometers.

إذا أردت شيئاً بصدق، تأمر الكون  
كله لمساعدتك على تحقيقه.

g. **G.D. Fahrenheit:**

G.D. Fahrenheit was the scientist who developed the first mercury thermometer in 1714.