

UNIT 2

CLASSIFICATION

- Revision of names of materials

Grammar and functions

- Expressing classification
- AS, HOW and LIKE
- Connectors
- Word formation: NOUNS from VERBS

There are many different classifications for materials; thus **ACCORDING TO THE STATE OF MATTER** we find **SOLIDS**, like **COPPER**, liquids **such as** water and **GASES**, for example **CARBON DIOXIDE**

A more interesting classification for engineers, **however**, is to **DIVIDE MATERIALS INTO METALS AND NON-METALS**. We can classify metals **DEPENDING ON WHETHER/if THEY ARE PURE METALS** like aluminium, or **ALLOYS**, for example **BRONZE**. In addition, **METALS CAN BE CLASSIFIED INTO** ferrous and non ferrous metals; in the first category we may **include IRON AND ALL OF ITS ALLOYS**, **whereas LEAD, GOLD OR MERCURY fall inTO** the group of non-ferrous metals.

With respect to non-metals, we can mention **CERAMICS, PLASTICS, COMPOSITES, RUBBER** and so on. **PLASTICS**, on the other hand, **CAN BE DIVIDED INTO** **thermoplastics** and **thermosets**. **The latter** cannot be reheated as **THEIR MOLECULAR STRUCTURE CHANGES** whereas **the former** do not undergo changes when heated; **therefore** they can be reshaped **AS MANY TIMES AS NEEDED**

On the basis of their **ELECTRICAL CONDUCTIVITY**, a further classification of materials could be made into **CONDUCTORS, INSULATORS AND SEMICONDUCTORS** **depending on** how readily **THEY PERMIT AN ELECTRIC CURRENT TO FLOW**.

MOST METALS are good conductors; however, there are also some non-metals which conduct well, **LIKE CARBON OR SALT WATER**. On the other hand, **PLASTICS AND CERAMICS ARE INSULATORS** as they do not permit the flow of electricity. Examples of semiconductors are **SILICON** or germanium; these materials **ACT AS CONDUCTORS OR INSULATORS** **depending on** the impurities added to them.

As we have seen, materials can be **classified IN MANY DIFFERENT WAYS** **depending on** the feature that we use as the basis of the classification.

Whether ≅ *if semi-synonyms* WHETHER they are pure metals OR alloys

If I win the lottery, I'll buy a car - whether

I need to buy a car, whether/if I win the lottery or not

Whereas ≅ *while*

(contrast) (contrast, time)

Whereas/while Pb, Au or Hg fall into the group of non-ferrous metals – CONTRAST

While I was waiting for you, my phone rang twice - whereas - TIME

METALS CAN BE CLASSIFIED INTO ferrous and non ferrous metals

– **in** many different **ways**

We can CLASSIFY metals INTO ferrous and non ferrous – **in** different **ways**

As we have seen, materials **can be classified INTO** different groups

METALS CAN BE CLASSIFIED INTO ferrous and non ferrous metals

We can CLASSIFY metals INTO ferrous and non ferrous

Most (Ø) metals are good conductors – *Plural, general noun Ø*

Most of the metals in the periodic table are solid at room temperature – *plural, specific - the*

Most of them are solid at room temperature – *Pronouns – Most of*

Iron and **most of** its alloys

Most iron alloys – *Not iron's alloys- the Sun's heat, the Earth's crust (unique elements)*

The alloys of iron (the possessive case is for people)

Most of the alloys containing iron

I like flowers - *general*

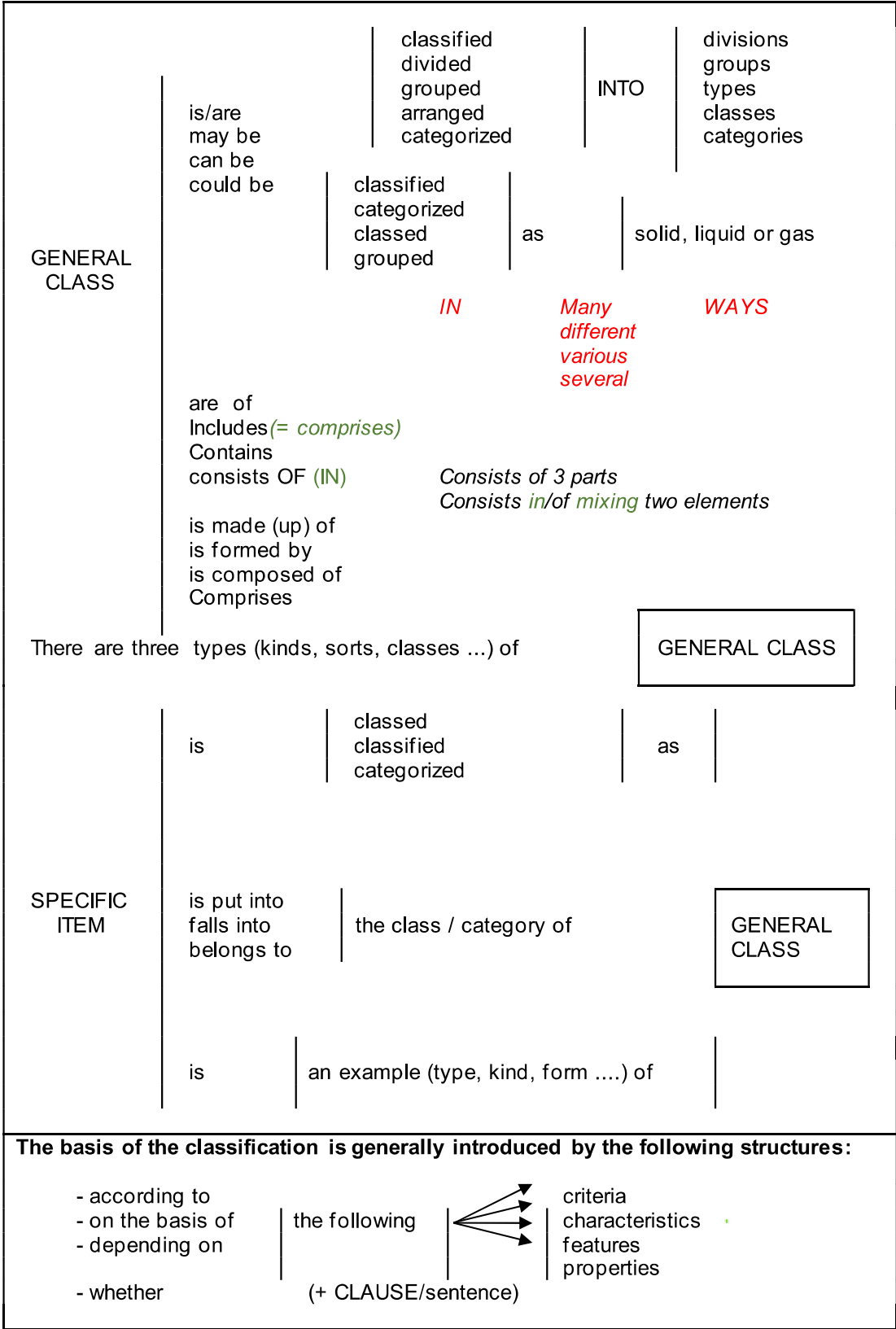
I like the flowers you gave me - *specific*

CLASSIFYING

A classification includes:

- a general class/a specific item or items
- a basis for classification (not always stated because it may be understood)

Here you have a list of the main structures used in writing CLASSIFICATION.



GRAMMAR: HOW / AS / LIKE

HOW	<p>= CÓMO (indirect interrogative) "He told me how to do it"</p> <p>= LO + ADJ KNOW-HOW "We have to know how fast the car runs – How fast does the car run? Do you know how fast the car is? Tell me how fast the car is How fast is the car?"</p>
LIKE	<p>Adjective = IGUAL o SEMEJANTE (- opposite of "unlike") "Like poles repel and unlike poles attract" <i>Equally charged poles repel and differently charged poles attract</i></p> <p>Preposition = IGUAL (QUE) "A is like B" or "He works like a horse". <i>He's not a horse- comparison</i> <i>A boiler in a power plant works like a big kettle</i></p> <p>= COMO POR EJEMPLO "Some common metals, like steel or brass, are alloys" =SUCH AS</p> <p>Expressions</p> <p>TO BE LIKE</p> <p>TO LOOK LIKE = SER PARECIDO A "This object looks like a square box"</p> <p>= COMO o PARECIDO A "The shape of the magnetic field is (rather) like an oval arc" <i>A magnetic field can be represented AS an oval arc</i></p> <p><i>Like is a comparison – As is an equivalence</i></p>
AS	<p>= EN CALIDAD DE "Oil is used as a fuel in power stations" – <i>it is a fuel- equivalence</i> <i>I work as a teacher = I'm a teacher (equivalence)</i></p> <p>= Comparative : "as ... as" "Thermoplastics can be heated as many times as required" <i>This material is AS malleable AS copper</i></p> <p>In co-relation with SAME : "the same AS" "Rubber has the same properties as plastics" <i>The atom has the SAME number of protons AS of electrons</i> <i>The melting point of iron is not THE SAME AS that of steel</i> <i>I want to buy the SAME car model AS you</i> <i>I want to buy the SAME car model THAT you have (THAT + sentence)</i></p> <p>= COMO + independent clause "As I was saying, magnetic fields cannot be seen" <i>As it was said (earlier)...</i> <i>As it was expected</i> <i>As expected</i></p> <p>Temporal constructions = A MEDIDA QUE- <i>gradually, progressively</i> "Steel becomes hard as/it cools down"</p> <p>Causal constructions = PUESTO QUE "Copper is widely used in wires as it is ductile and malleable" = BECAUSE, SINCE</p> <p>Expressions AS IF / AS THOUGH = COMO SI (+ subjunctive) (PAST) SO AS TO = CON OBJETO DE, PARA (+ infinitive) AS FAR AS...(is/are) concerned= EN CUANTO A, CON RESPECTO A TO BE KNOWN AS = SE CONOCE COMO TO BE CONSIDERED/REGARDED AS = SE CONSIDERA COMO</p>

Note that "SUCH AS" = "LIKE" (POR EJEMPLO)

"Such countries as Japan or the USA run our modern society" = "Countries like Japan or the USA ..." = "Countries such as Japan or the USA ..."

Complete these sentences with “such as”, “like”, “as” and “how”.

1. **AS** expected, the lecture began 2 hours late.
2. I am going to explain **HOW** electrolysis can be used **AS** a process to coat objects with thin films/*layers/(coats)* of metals **LIKE/SUCH AS** chromium or gold.
3. Electroplating is **LIKE** painting an object but covering it with a metal.
4. We can observe **HOW** the needle moves **AS** we place the compass near a coil.
5. A piece of iron can be used **AS** a magnet when it is magnetized.
6. Thermosets break down **AS** their temperature rises.
7. Some metals, **LIKE/SUCH AS** aluminium and copper, are pure metals.
8. I have never used a device **LIKE** this one before.
9. Semiconductors act **AS** conductors under certain conditions but **AS** insulators under others. **ACT AS/BEHAVE LIKE/WORK LIKE**
10. Electrons are attracted by positively charged particles **AS** they have a negative electric charge.
11. The boiler of a power plant works **LIKE** a big kettle.
12. Some new materials behave **LIKE** both solids and liquids.
13. **AS** tin is fairly weak, it is not used in structures
14. Computers may change the order of some instructions so **AS TO** improve performance

Connectors are used to express logical concepts, such as contrast (e.g., HOWEVER, WHEREAS, ON THE OTHER HAND) cause (e.g., BECAUSE, AS, DUE TO) or effect (e.g. THUS, THEREFORE, IN THIS WAY); rephrasing (THAT IS, i.e., IN OTHER WORDS), among others.

1. Copper is a good conductor, **THEREFORE/thus** it is used in wires.
2. Cast iron is not used to **withstand** impact loads **DUE TO** its brittleness. **Withstood-withstood**
Become-became-become
Undergo-underwent-undergone
3. Titanium is used for aircraft frames **BECAUSE/AS/SINCE** it is light and strong.
4. Chromium resists/withstands corrosion; **-THUS/THEREFORE---** when added to steel the result is stainless steel
5. Aluminium and iron are pure metals **WHEREAS/WHILE** bronze and steel are alloys
6. Stainless steels have a high strength. **ON THE OTHER HAND/HOWEVER**, they are difficult to machine.
7. Tin is used to coat other materials to protect them **BECAUSE OF/DUEAS/SINCE** it resists corrosion
8. Tin is expensive; **THUS/THEREFORE** the coats of tin are very thin.
9. Nickel and chromium improve the properties of metals; **THUS/THEREFORE/SO** they are added to steels.
10. Alloys, **THAT IS/i.e.**, mixtures of different metals, are widely used in engineering

WORD FORMATION

One of the most important processes of word formation in technical English is the formation of NOUNS. We studied different suffixes to transform ADJECTIVES into NOUNS. Now we will see the most important suffixes to transform VERBS into NOUNS

-ING	Building
-TION/SION	Explanation, emission
-MENT	Management
-ANCE	Performance
-URE	Mixture, pressure

-ANT/ENT	Coolant/content
-ER/-OR	Boiler, conductor
-AGE	Drainage
-AL	Disposal
-Y	Discovery

EXERCISE

A. Complete these sentences which illustrate other types of word formations, either ADJECTIVES or NOUNS/ADVERBS

1. This is an alloy suited for use in processes involving **EXPOSURE** (EXPOSE) to **GAS** (GAS) fluorine.
2. **IMPROVEMENT(S)** (IMPROVE) in its corrosion **RESISTANCE** (RESIST) have yet to be **FULLY** (FULL) established, but **PITTING** (PIT) resistance is reported to be somewhat better than Type 317LM.

3. Since aluminium has about one-third the **DENSITY** (DENSE) of steel, its **SUBSTITUTION** (SUBSTITUTE) **for** steel in automobiles would seem to be a sensible approach to reducing **WEIGHT** (WEIGH) and thereby reducing **HARMFUL** (HARM) **EMISSIONS** (EMIT).

4. Two primary properties of any metal are its **STRENGTH** (STRONG) defined as its **ABILITY** (ABLE) to resist **DEFORMATION** (DEFORM) and its elastic modulus which is its **RESISTANCE** (RESIST) to **DEFLECTION** (DEFLECT).

5. Other advances in aluminium technology are alloys for air-conditioner **COMPONENTS**/(**composites**) (COMPOSE) that are designed to be **CHEMICALLY** (CHEMICAL) compatible with **ENVIRONMENTALLY** (ENVIRONMENT) safer **COOLERS** (COOL) and to withstand higher **PRESSURE** (PRESS).

B. Now complete this paragraph about aluminium

An important **ACTIVITY** of materials **ENGINEERING** is that of alloy **DEVELOPMENT**, which in some cases involves designing alloys for specific **APPLICATIONS**. Ordinarily metal castings exhibit very little **TOUGHNESS** or **DUCTILITY** and are therefore prone to fracture followed by catastrophic **FAILURE**.

Many advances in aluminium technology have led to a greater **ACCEPTATION** of aluminium in vehicles. For example, there are alloys for air-conditioning **COMPONENTS** that are designed to be compatible with safer **REFRIGERATORS** or **COOLERS** and to withstand higher **PRESSURE**. Also, alloys have been developed that combine good **WORKABILITY** and corrosion **RESISTANCE** with the **ABILITY** to achieve maximum **STRENGTH** without heat **TREATMENT**.

GRAMMAR REVISION

There are **MANY** (*muchos*) types of **STEEL** (*acero*) **DEPENDING ON/ON THE BASIS OF/ACCORDING TO** (*según*) the materials added to it.

For example, steel that contains **VERY LITTLE** (*muy poco*) **CARBON** (*carbono*) is known **AS** (*como*) low carbon steel, and it is very malleable. **HOWEVER** (*Sin embargo*) steel with a higher carbon content becomes **LESS** (*menos*) malleable, **AS** (*ya que*) carbon makes it harder and **THEREFORE** (*por lo tanto*) more difficult **TO MOULD/shape** (*de moldear*), but **ON THE OTHER HAND** (*por otra parte*) it can resist higher loads. Other types of **STEEL** (*acero*) include some other materials, **LIKE/SUCH AS** (*como*) chromium to make **STAINLESS STEEL** (*acero inoxidable*). **THUS** (*Así pues*), we can classify steel **INTO** (*en*) different groups **ACCORDING TO** (*según*) the properties that we require and **H^oOW** (*cómo*) the steel is manufactured.

Many substances can exist **as a liquid, a gas, or a solid**; but **even though** matter can exist in different states, it maintains **its/the same** chemical composition. As chemists studied **these** different states of matter, they came to understand that there was a regularity and pattern about the way that **all substances** behaved. We are going to look at some of these patterns and the theories that **have been developed** to explain them.

Temperature is the primary **variable** that determines **whether** a substance is a gas, a liquid or a solid. It takes kinetic energy, or heat, to convert a substance **from a solid to a liquid**, and then to a gas. The kinetic energy of that heat makes it **easier** to break the attractions **between** the particles of molecules and atoms. Conversely, when a substance turns to/from? a gas, to a liquid, to a solid, **it loses heat**.

All elements, and all substances, have temperature points **where they convert** from a solid, to a liquid and **then** gas. **Even** metals with very strong bonds, can be converted to liquid and vapour **if enough heat is added** to the substance.

The **understanding** of the characteristics of gases, liquids and solids has had an impact on **many aspects** of **our lives**. It has been vital in the development of **many of the technologies** in our modern world.