3. _____

4. _____

5. _____

6. _____

7. _____

8. _____

9. _____

10. _____



# UNIT V

Colaboración:
ING. GABRIELA ELIZONDO

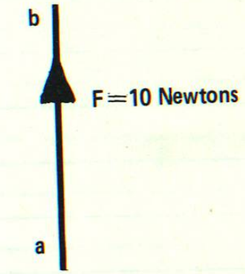
OBJETIVO: El alumno, de acuerdo con estructuras gramaticales aprendidas con anterioridad identificará y comprenderá la información que presenta la lectura: "Cantidades físicas en Ingeniería".

## V. 1 READING.

### A) PHYSICAL QUANTITIES IN ENGINEERING.

We deal with many different physical quantities in Engineering. They can be divided into two groups - scalar and vector quantities. Both have size or magnitude but only vector quantities possess direction. Force which we measure in newtons possesses magnitude and direction. Force then, is a vector quantity. Other examples are acceleration and velocity.

Any vector quantity can be represented by a vector. The straight line a - b in the diagram is a vector which represents a force. If we calculate its length we find that it's proportional to the magnitude of the force. The direction of the line indicates the direction of the force. It's important also to know in what sense of direction the force is acting. The arrow head of the line shows that the sense of direction of the force is upwards.




Scalar quantities are simply described by giving their magnitude in a suitable unit of measurement. For example, we can describe the mass of a body as a quantity of grammes, the capacity of a container as a number of cubic meters and a period of time as so many seconds. We can also illustrate scalar quantities by points or divisions on a scale. Thus, a clock is a scale for measuring time. Similary, a meter stick is a scale for measuring length and a thermometer is a scale for measuring heat.

**OBJETIVO: El alumno para demostrar el grado de comprensión alcanzado sobre la lectura: "Cantidades físicas en Ingeniería" será capaz de traducirla al español.**

V. 1.1. Translate to Spanish the reading: "Physical quantities in Engineering".

OBJETIVO: El alumno, respondiendo por escrito a los ejercicios comprobará el grado de comprensión alcanzado sobre la información que presenta la lectura: "Cantidades Físicas en Ingeniería".

## A) COMPREHENSION EXERCISES

V. 1.2. Briefly answer in Spanish the following questions according to the reading: "Physical Quantities in Engineering".

1. What group can physical quantities be divided into?
   _____ and _____

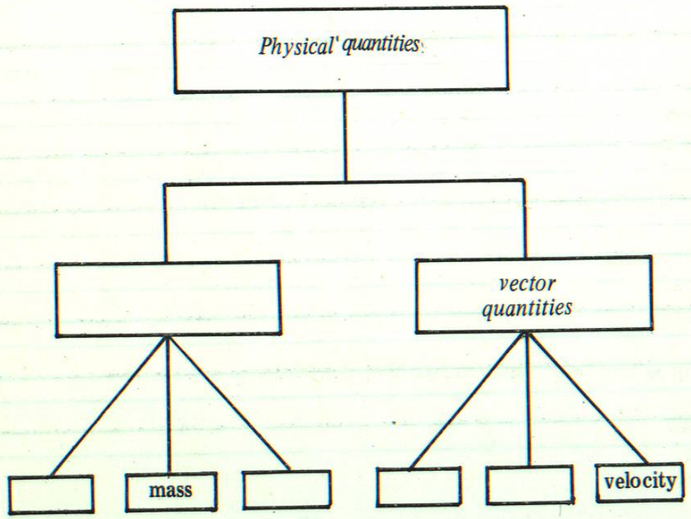
2. What are two examples of scalar quantities?
   _____ and _____

3. What units can we use in measuring force?
   _____

4. How are scalar quantities described?
   _____

5. What kind of scale is a thermometer?
   _____

V. 1.3. Complete the following diagram to make the classification of physical quantities. Use the information from the reading to help you.






V. 1.4. Write true (T) or false (F) in the following sentences.

1. Scalar quantities have direction. _____
2. Force is an example of a scalar quantity. _____
3. We measure force in meters. _____
4. Physical quantities can be divided into vector and scalar quantities. _____
5. A meter stick is a scale for measuring length. _____

V. 1.5. Choose the corresponding letter and place it in the parenthesis.

1. An example of a scalar quantity is. . . . . ( )

   a) force.
   b) weight.
   c) acceleration.

2. A meter stick is a scale for measuring . . . . . ( )

   a) weight.
   b) length.
   c) capacity.

3. We can describe the capacity of a container as a number of . . . . . ( )

   a) cubic meters.
   b) seconds.
   c) pounds.

4. Scalar quantities have magnitude, but they don't have . . . . . ( )

   a) weight.
   b) scale.
   c) direction.

5. One of the following quantities isn't a vector, which one isn't?. . . . . ( )

a) Time.
b) Force.
c) Velocity.

V. 1.6. Relate both columns according to the meaning of each word.

| | |
|---|---|
| 1. Straight line | ( ) Determine dimensions and size. |
| 2. Measure | |
| 3. Length | ( ) Graduated measure. |
| 4. Also | |
| 5. Down | ( ) That is repeated again. |
| 6. Heat | |
| 7. Scale | ( ) Direct line. |
| 8. Upwards | |
| | ( ) That goes up. |



OBJETIVO: El alumno, de acuerdo con estructuras gramaticales aprendidas con anterioridad identificará y comprenderá la información que presenta la lectura: "Electricidad la fuerza que transformó al mundo"

V. 2. READING.

B) ELECTRICITY - THE FORCE THAT TRANSFORMED THE WORLD.

In order to talk about electricity, it's necessary first to talk about the atom. Ancient Greeks believed that all matter was made up atoms. The word "atom" in fact comes from the Greek word "atoms" which means indivisible. It wasn't until 1897 that it was discovered that the atom is not indivisible but is composed of even smaller particles. Among these particles is one called the electron.

Electrons orbit around the center or nucleus of the atom, much as the planets in the solar system orbit around the sun. Electrons closer to the nucleus are held more tightly than those in the outer orbits. It is electrons in the outermost orbit of certain kinds of atoms that can be made to flow as electric current.

Electrons flow easily through certain kinds of materials called "conductors". Many metals such as silver, copper, gold, and aluminum are good conductors. Good conductors are used in electric circuits to provide a path for the current.

Other substances provide strong resistance to the flow of current. These substances are called "insulators", which are used to confine a current to the desired path. Substances such as hard rubber, glass, wax and certain kinds of plastics are good insulators. Thus the cord of an electric appliance consists of a piece of wire, generally copper, surrounded by a type of plastic or vinyl, which is the insulator.

The pressure that makes electrons flow along wires is called "voltage". Voltage may be created by a generator at a power plant or by an electric battery. When you turn on the light or an electric appliance, electrons are drown from a generator at a power plant. When you turn the light off, there will be electric pressure or voltage built up at a switch, but no current will flow. It is somewhat similar to the way a water system works.

**OBJETIVO: El alumno para demostrar el grado de comprensión alcanzado sobre la lectura: "Electricidad - la fuerza que transformó al mundo" será capaz de traducirla al español.**

V. 2.1. Translate to Spanish the reading: "Electricity - the force that transformed the world"

OBJETIVO: El alumno, respondiendo por escrito a los ejercicios comprobará el grado de comprensión alcanzado sobre la información que presenta la lectura: "Electricidad la fuerza que transformó al mundo".

## B) COMPREHENSION EXERCISES

V. 2.2. Briefly answer in Spanish the following questions according to the reading: "Electricity - the force that transformed the world"

1. Who was the first that believed that all matter was made up of atoms?

   _____

2. When was it discovered that atoms are composed by smaller particles?

   _____

3. What's one of the principal atomic particles?

   _____

4. How is the material where electrons flow easily through called?

   _____

5. How are the substances that provide strong resistance to the flow of current called?

   _____

V. 2.3. Choose the corresponding letter and place it in the parenthesis.

1. Electrons will flow easily through copper and silver because they are good. . . ( )

   a) particles.
   b) conductors.
   c) insulators.

2. Electrons are smaller particles of. . . . . ( )

   a) circuits.
   b) voltage.
   c) atoms.

3. Similar to the way that planets orbit around the sun, electrons in the atom orbit around. . . . . ( )

   a) nucleus.
   b) flow.
   c) voltage.



4. A substance that offers strong resistance to the flow of electric current is called . . . . . ( )

   a) a conductor.
   b) an appliance.
   c) an insulator.

5. Rubber, glass and wax, are good . . . . . ( )

   a) generators.
   b) insulators.
   c) conductors.

V. 2.4. Write true (T) or false (F) in the following sentences.

1. With a light turned off no current will flow but there will be voltage at the switch.

   _____

2. Aluminum and gold can be used as conductors. _____

3. An electric cord consists of wire surrounded by a conductor. _____

4. Plastic and vinyl are often used as good conductors. _____

5. Voltage can be created by a battery. _____

V. 2.5. Fill in the blanks in the following sentences. _____

1. Substances such as rubber, glass and wax are good _____

2. The cord of an electric appliance consists on a piece of wire (copper), surrounded by _____

3. The pressure that makes electrons flow along wire is called _____ .

4. When you turn _____ a light, no current will flow.

5. The _____ ___ believed that all matter was made up of atoms.

V. 2.6. Relate both columns inserting the letter that corresponds.

1. (Al) Light metallic chemical element.
2. Certain way. ( ) Wire.
3. Constructed of. ( ) Path.
4. Belonging to former times, very old. ( ) Insulator.
5. Thread of metal. ( ) Copper.
6. (Cu) Metallic element of reddish color. ( ) Ancient.
7. Non conductor of electricity.



OBJETIVO: El alumno, de acuerdo con estructuras gramaticales aprendidas con anterioridad identificará y comprenderá la información que presenta la lectura: "Los halogenos".

V. 3. READING.

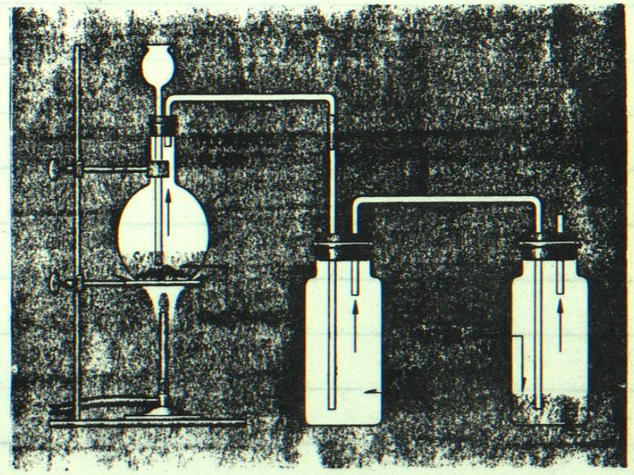
C) THE HALOGENS.

Four elements different in their physical and chemical properties from the six noble gases are the diatomic element fluorine $F_2$, chlorine $Cl_2$, bromine $Br_2$, and iodine $I_2$. Fluorine is a violently active pale-yellow gas that can only be prepared and handled safely under strictly controlled conditions. Chlorine is a dense, choking, poisonous greenish-yellow gas of high chemical activity. Bromine is a redbrown highly corrosive volatile liquid at room temperature. Iodine exists as beautiful silver-black crystals of relatively high vapor pressure that yield a violet vapor.

The first halogen to be discovered was chlorine. Scheel obtained it in 1774. The gas made his nose and throat sting and almost blinded him. The method by which chlorine was first prepared is still the common laboratory method used today. Manganese dioxide $Mn0_2$ and hydrochloric acid HCL are mixed in a flask and heated resulting the liberation of chlorine gas $Cl_2$. The chlorine gas is heavier than air and is normally collected as shown in Figure by displacing air from a second flask.

The equation of the reaction is:

$$Mn0_{2(s)} + 4\,HCl \rightleftharpoons 2H_20 + MnCl_{2(aq)} + Cl_2$$

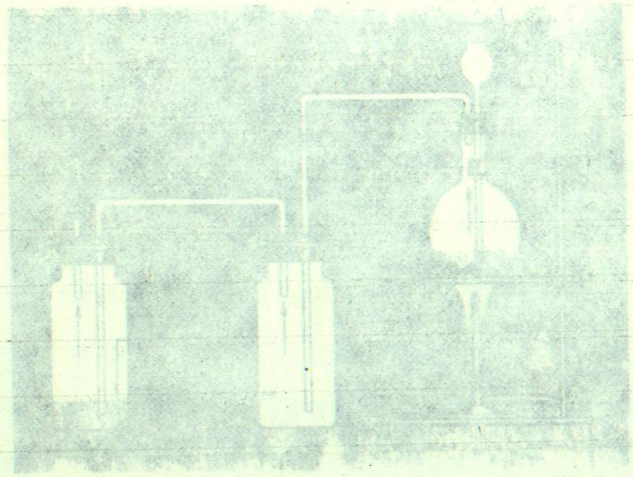


Bromine and iodine are also prepared by the action of $MnO_2$ on water solutions of their acid hydrobromic HBr and hydrioic HI. The $MnO_2$ is added and the mixture heated. The final equations for the preparation of bromine and iodine are:

$$MnO_2 + 4HBr \rightleftharpoons 2H_2O + MnBr_2 + Br_2$$

$$MnO_2 + 4HI \rightleftharpoons 2H_2O + MnI_2 + I_2$$

Fluorine cannot be prepared in the same way. In fact fluorine can only be prepared using specialized equipment not commonly found in most laboratories.





**OBJETIVO: El alumno para demostrar el grado de comprensión alcanzado sobre la lectura: "Los halógenos", será capaz de traducirla al español.**

V. 3.1. Translate to Spanish the reading: "The halogens".