

## Lesson 5

# Combining semiconductors with phosphors

**a** In pairs, discuss the questions.

1. What do the letters LED stand for?
2. What do you know about LEDs?
3. When and where were they invented?
4. What sorts of devices use LEDs?

**b** Complete the spaces in the text with *is* or *are* plus one of the prepositions in the box. The first two have been done for you.

as

by (x 3)

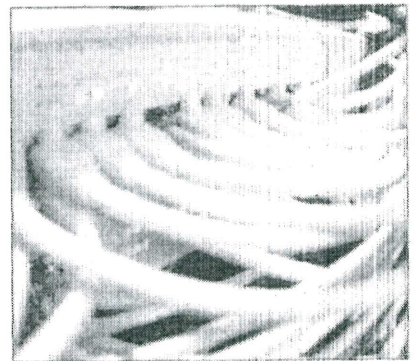
from

in (x 2)

through

with

An LED (light-emitting diode) is a device that emits visible light when an electric current passes through it. To manufacture LEDs, semiconductors (1) *are* combined (2) *with* phosphors. When electricity (3) \_\_\_\_\_ passed (4) \_\_\_\_\_ a diode, infrared radiation (5) \_\_\_\_\_ emitted (6) \_\_\_\_\_ the semiconductor. This radiation (7) \_\_\_\_\_ absorbed (8) \_\_\_\_\_ the phosphors in the diode and it (9) \_\_\_\_\_ then reemitted (10) \_\_\_\_\_ visible light. LEDs (11) \_\_\_\_\_ used (12) \_\_\_\_\_ the indicator lights and in the alphanumeric displays on many of the electronic devices and appliances that we use at home and at work.



The semiconductors that (13) \_\_\_\_\_ used (14) \_\_\_\_\_ LEDs are called III-V compound semiconductors. This is because they (15) \_\_\_\_\_ made (16) \_\_\_\_\_ combinations of elements from column III of the periodic table (aluminum, gallium, and indium) and elements from column V of the periodic table (phosphorus, arsenic, and antimony). The precise ratio of column III elements to column V elements in a semiconductor (17) \_\_\_\_\_ selected (18) \_\_\_\_\_ the manufacturer. In this way, the specific characteristics of an LED—color, the amount of visible versus infrared radiation, and brightness—are determined.

### History capsule

The Periodic Table of Elements, which orders the elements according to their atomic numbers and groups them in columns according to shared chemical characteristics, was devised in 1869 by Russian chemist Dmitri Mendeleev (1834–1907).



**c** Read the completed text in Exercise **b** and match the two halves of the sentences.

- |  |               |                              |
|--|---------------|------------------------------|
| 1. LEDs are made from semiconductors and . . .         | _____ c _____ | a. compound semiconductors.  |
| 2. The phosphors turn infrared radiation into . . .    | _____         | b. elements can be adjusted. |
| 3. LEDs are used in the alphanumeric displays on . . . | _____         | c. phosphors.                |
| 4. LED semiconductors are known as III-V . . .         | _____         | d. brightness of an LED.     |
| 5. The ratio of column III and column V . . .          | _____         | e. electronic devices.       |
| 6. The ratio of III and V elements affects the . . .   | _____         | f. visible light.            |

**d** Check  the types of texts where the passive voice is more likely to be used.

- |   |   |
|---|---|
| <input type="checkbox"/> a newspaper report                 | <input type="checkbox"/> a public notice                      |
| <input type="checkbox"/> a personal letter                  | <input type="checkbox"/> a description of a technical process |
| <input type="checkbox"/> a set of instructions              | <input type="checkbox"/> a postcard                           |
| <input type="checkbox"/> an article in a scientific journal | <input type="checkbox"/> an entry in a personal diary         |
| <input type="checkbox"/> a children's story                 | <input type="checkbox"/> a company press release              |

**e** In pairs, compare and discuss the types of passive voice texts that you come across in your own field of study or work.

*I often have to read sets of instructions.*

**f** In your notebook, write a description of a technical, industrial, or manufacturing process using the *passive voice* in the present. Use the verb participles in the box plus any other verbs you know.

**Example:**

The metal is heated. The components are assembled. The metal parts are then attached to the base.

assembled	constructed	cleaned	converted	connected	evaluated
extracted	joined	heated	manufactured	inserted	measured
placed	removed	processed	selected	programmed	separated
studied		tested		treated	

**g** In small groups, take turns reading aloud descriptions of manufacturing or technical processes without saying the name of the final product. Your classmates have to guess what is being described.