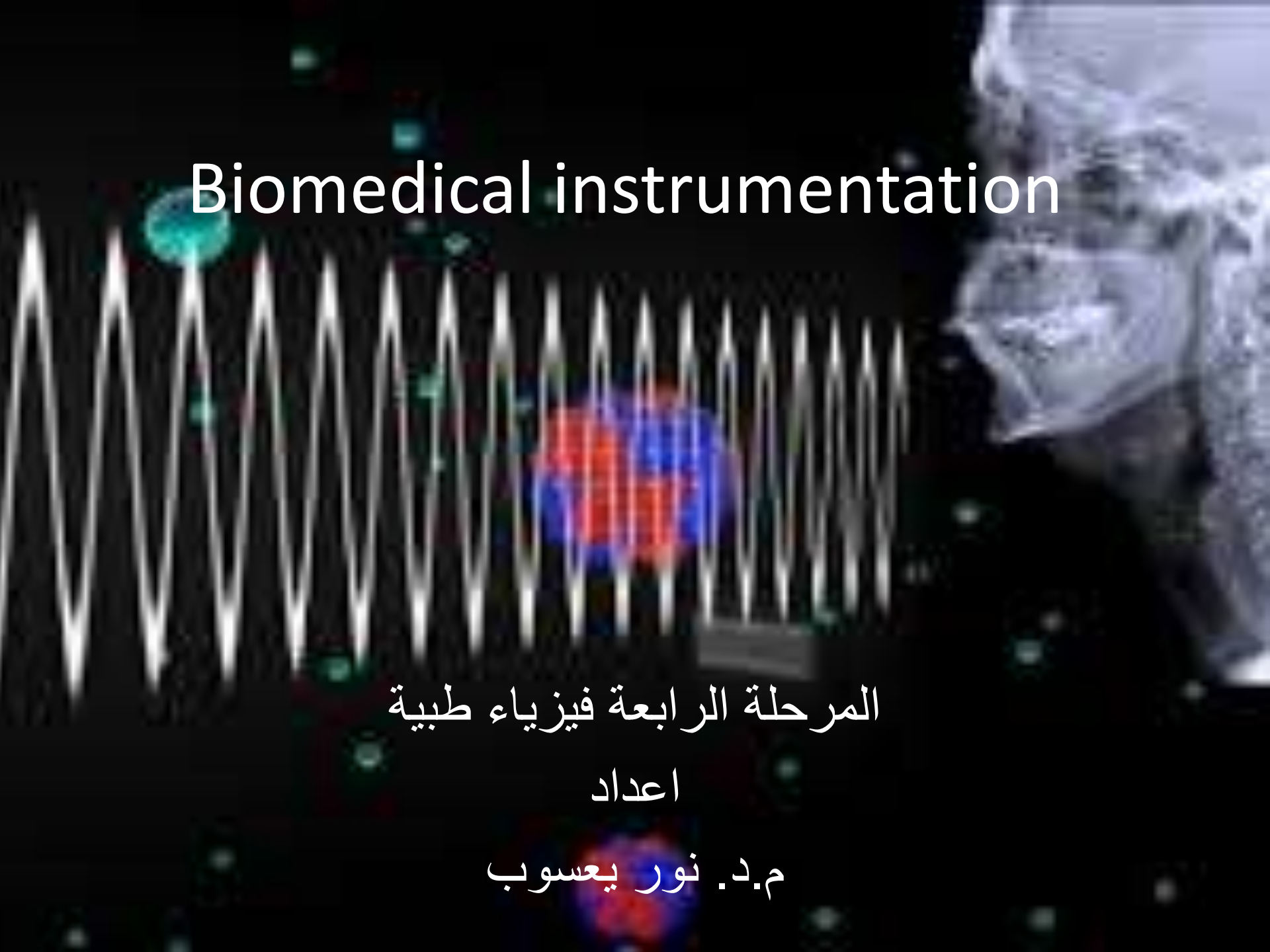
Biomedical instrumentation



المرحلة الرابعة فيزياء طبية

اعداد

م.د. نور يعسوب

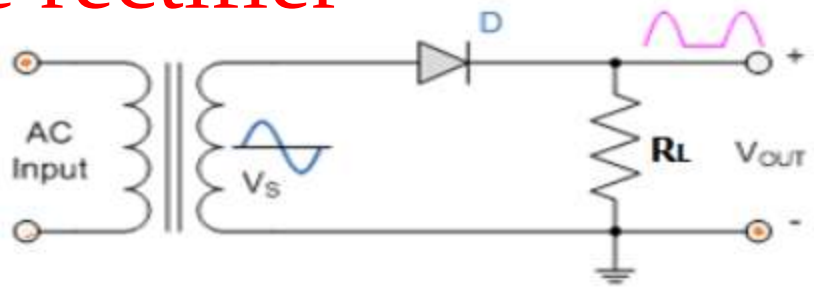
4- High Tension Generator.

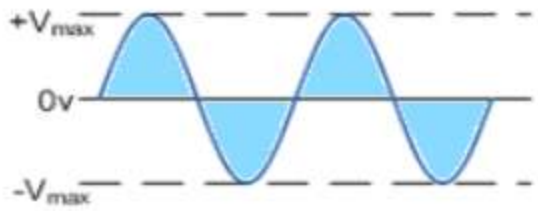
- To generate high tension must be connect it to a high voltage source, it can be obtained from a transformer.
- A unit circuit (Rectifier) is connected to the secondary transformer of the high pressure transformer and it is called the high pressure transformer and the rectifier circuit to the high pressure generator.

Rectifier

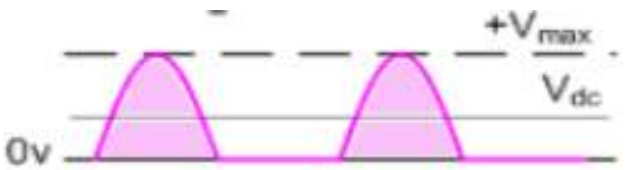
- Rectification is converting alternating current (AC) to direct current (DC).

- Half wave rectifier





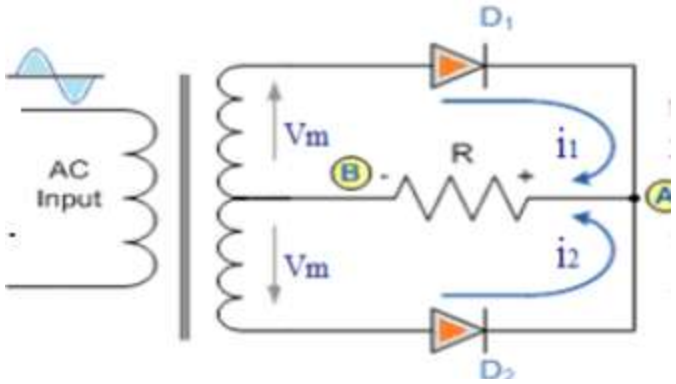
Input AC

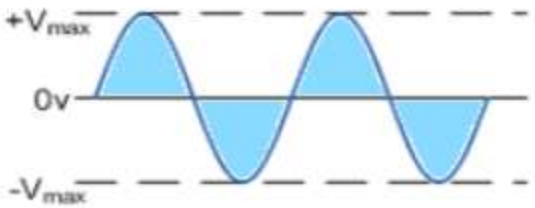


Output DC

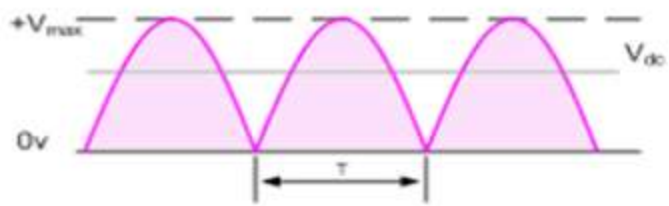
Full-Wave Rectifier

It is noticed from a half-wave rectifier circuit that the load is supplied with current during only half of the wave. As for the second half, it is wasted. It is also possible to exploit the second half in order to increase the efficiency of the rectification and to obtain a greater continuous current capacity by Full wave Rect.





Input AC



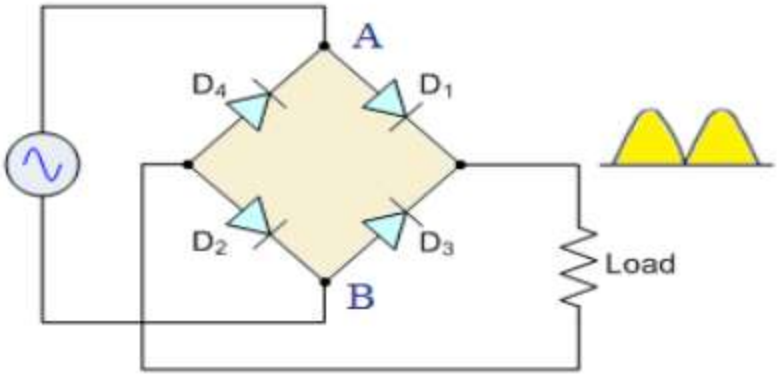
Output DC

Full-Wave Rectifier(Bridge Rectifier)

Advantages of Bridge Rectifier

1- The reverse peak voltage is half of what it is in a full wave rectification circuit using two diodes.

2- The Bridge uses half the number of turns of the secondary coil to be used with a full wave rectification circuit with two pairs.



- There are many types of high pressure generators, and they depend on the main source of single-phase or three-phase voltage supply. Three-phase high-pressure generators have the following advantages over single-phase high-pressure generators:
- 1- Generate a high current.
- -2 Generate a large amount of radiation.
- -3 Time is short.
- The disadvantages of three-phase high-pressure generators compared to single-phase high-pressure generators are: -
- -1 more expensive.
- -2 More complex in its electronic circuits.
- -3 larger size and take up more space.

The most important feature in describing any high pressure generator is the power output from the generator, which is measured in kilowatts.

Types of single-phase high pressure generators

- One-Pulse generator
- Two-Pulse generator

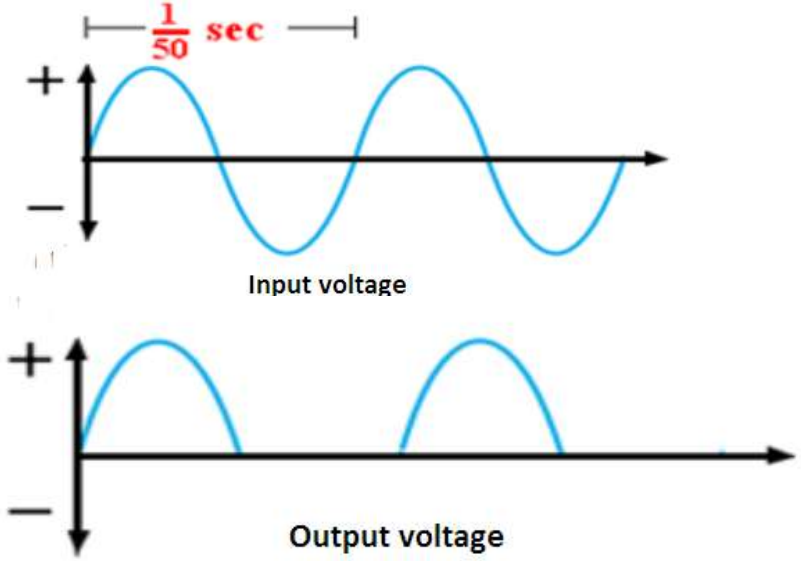
While the types of Three-phase generators

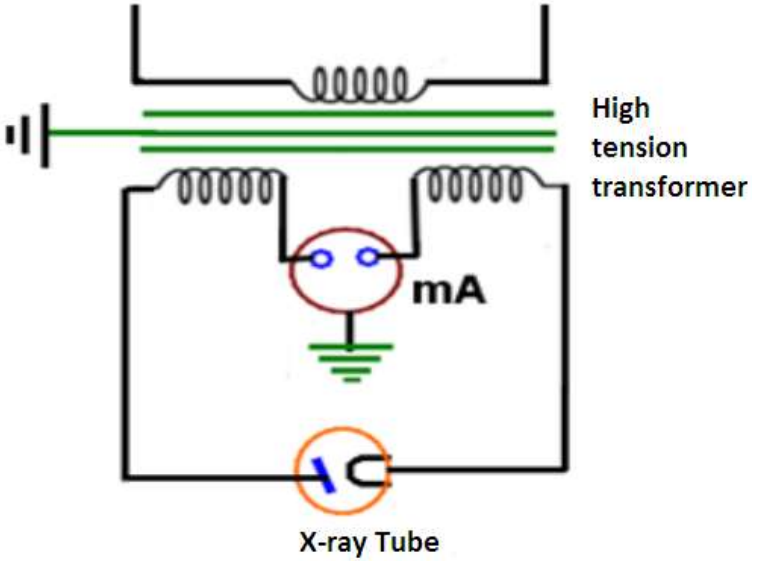
- Six-Pulse Generator
- Twelve-Pulse Generator

Types of single-phase high pressure generators

1- One-Pulse generator

During the first half of the wave, the anode of the X-ray tube of the transformer is connected to the positive pole of the transformer and the cathode is connected to the negative pole. In this case, the electrons move towards the anode and the X-rays are generated.

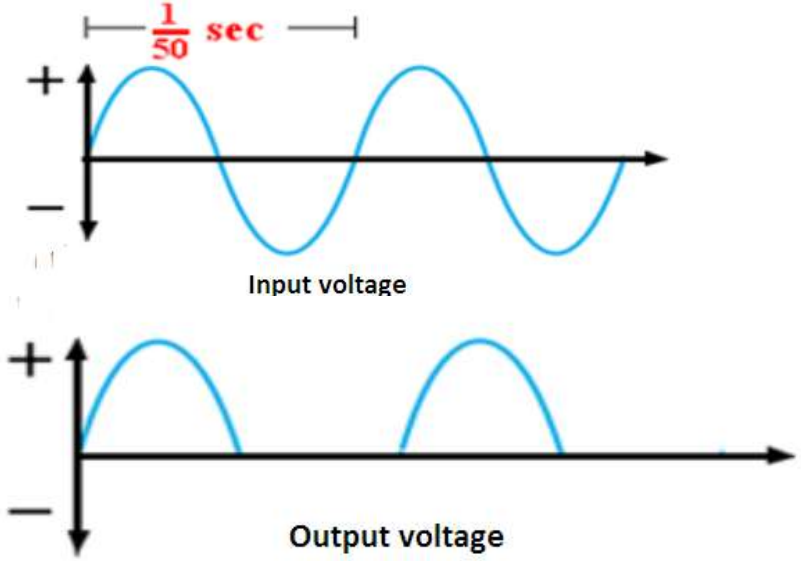


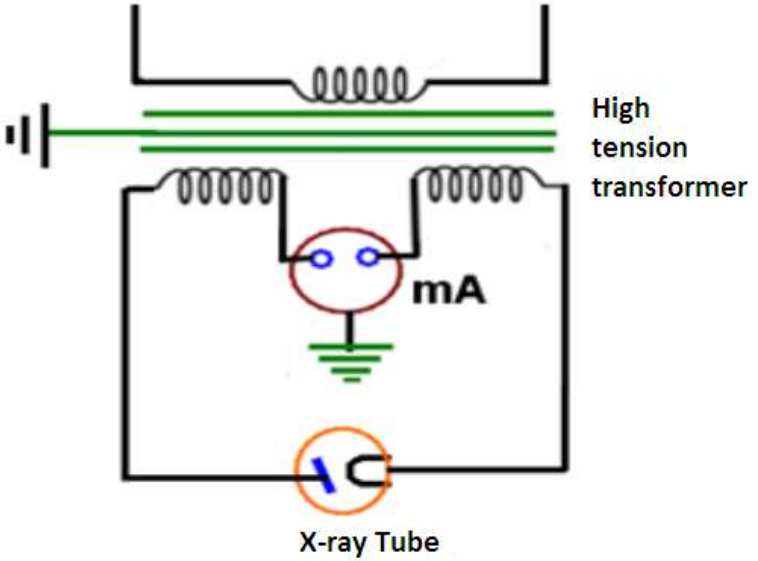


Types of single-phase high pressure generators

One-Pulse generator

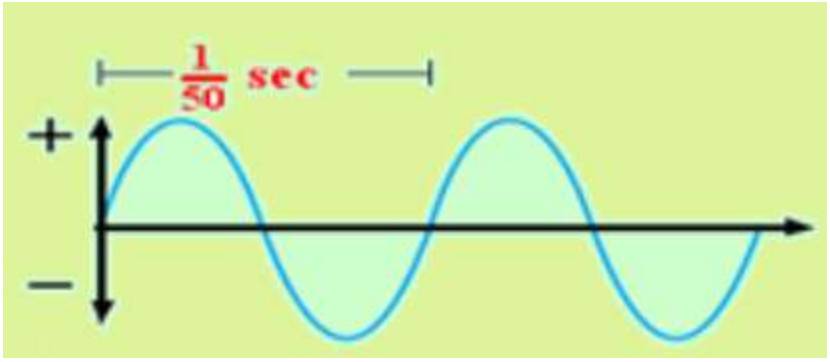
While during the second half of the wave, the anode of the X-ray tube is connected to the negative pole and the cathode is connected to the positive pole. In this case, the electrons do not move towards the anode and the X-ray is not generated. Therefore, a single pulse is generated

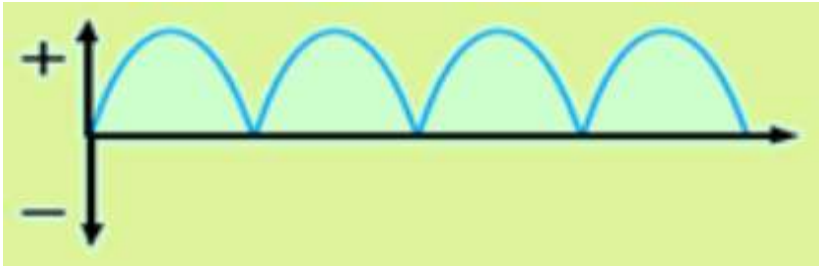


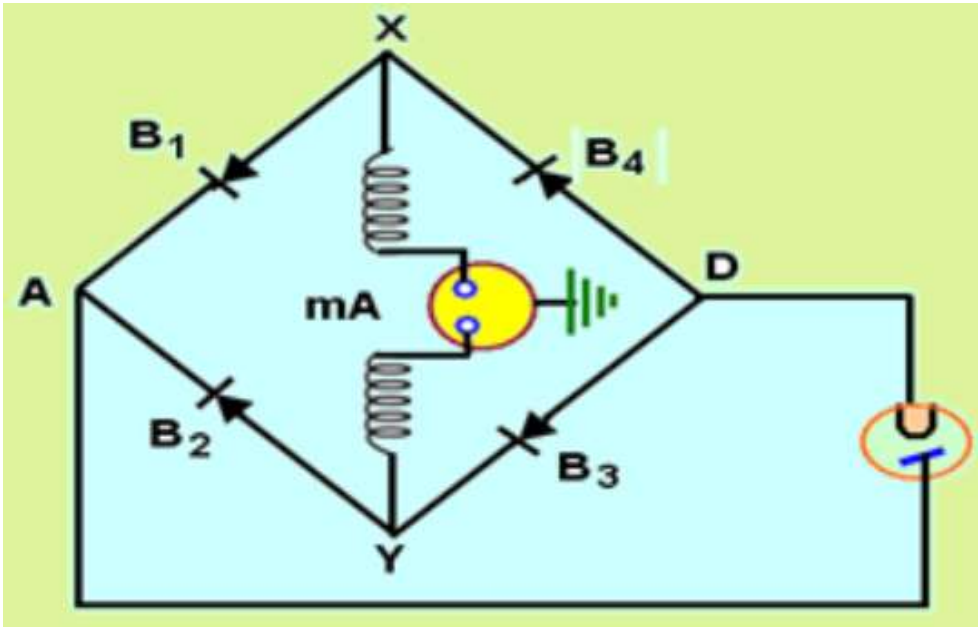


2-Two-Pulse generator

In a full wave rectifier circuit, the bridge circuit type as shown in the figure and we mentioned earlier, this type of rectifier generates two pulses, as it rectified the first half of the wave as well as the second half of the wave, so we get two pulses within one wave.

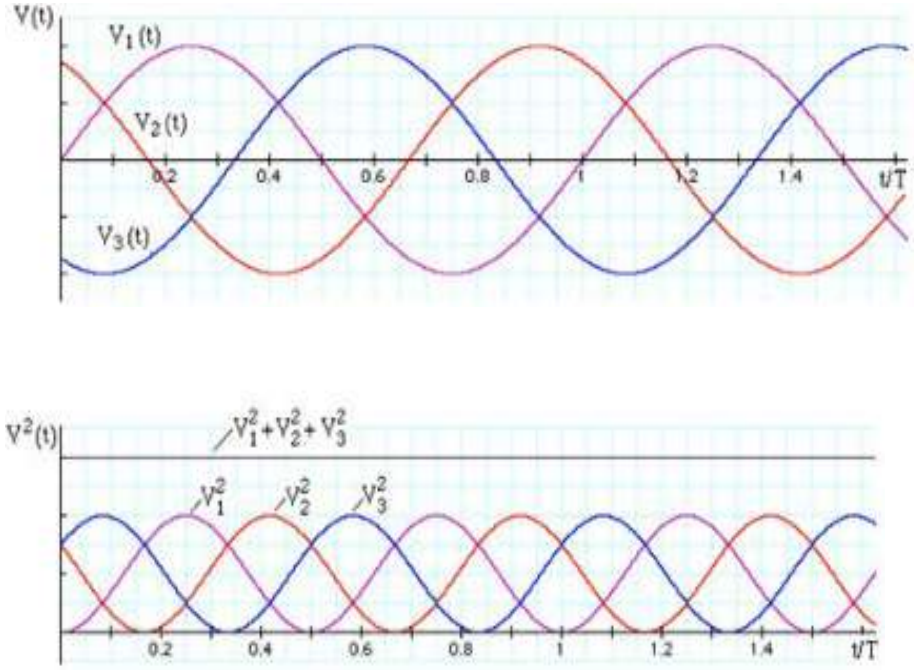


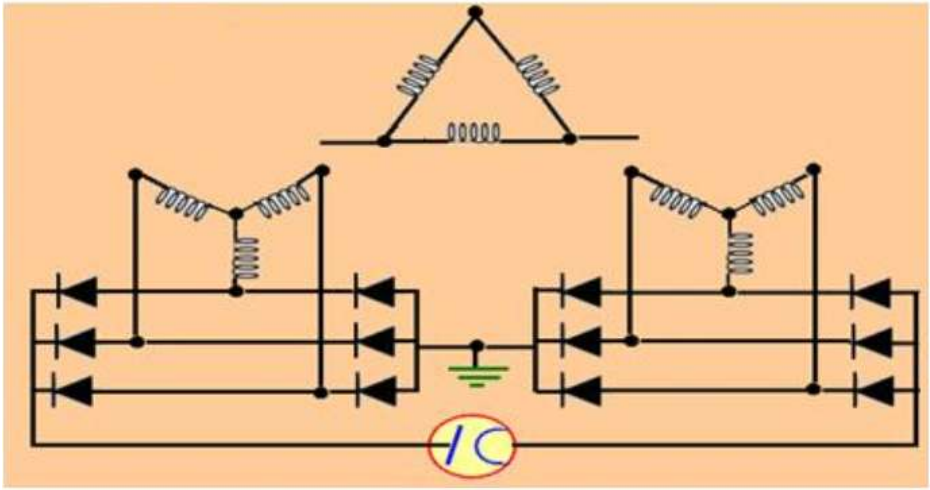




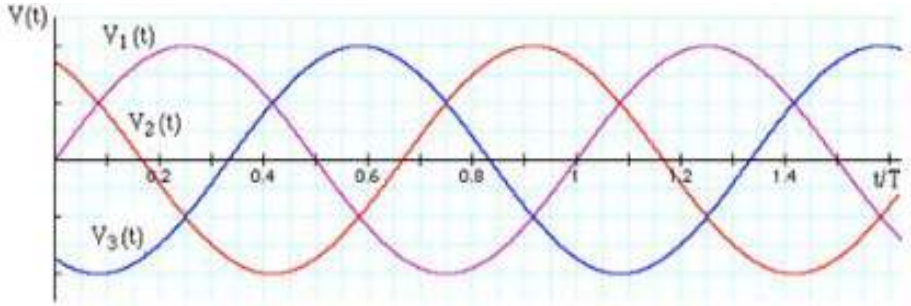
Types of three-phase high pressure generators

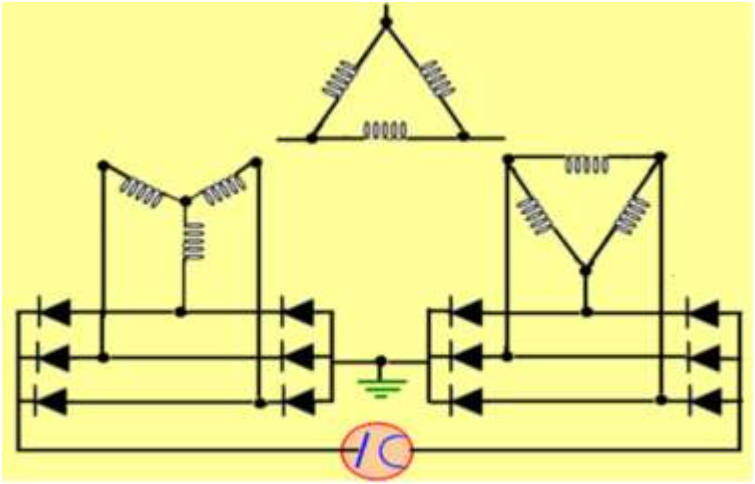
1- Six-Pulse Generator

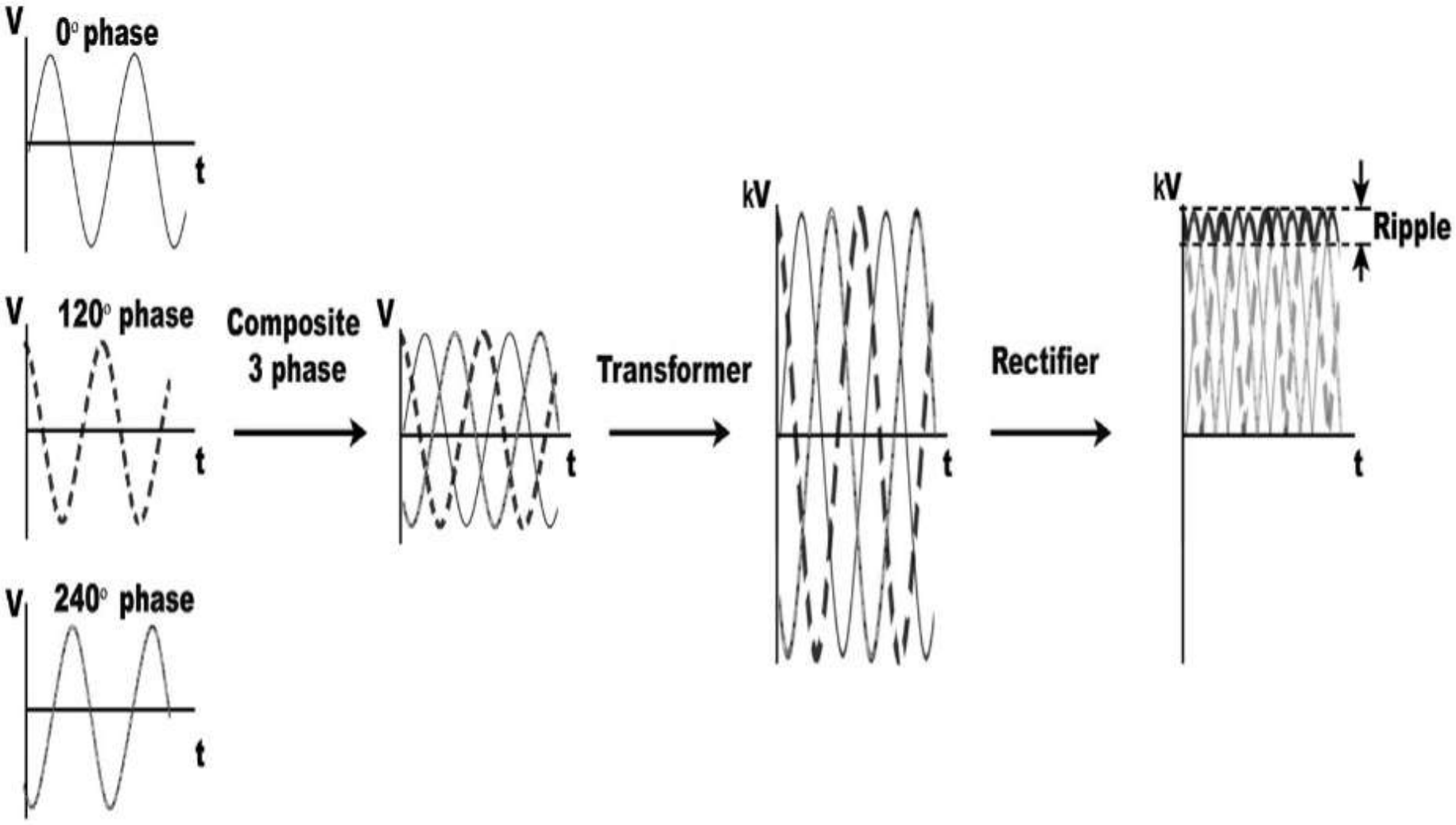




2- Twelve -Pulse Generator






V
0° phase
t
V
120° phase
t
V
240° phase
t
Composite
3 phase
V
t
Transformer
kV
t
Rectifier
kV
Ripple
t

5- **Tables and Bucky**

- There are different types of tables that provide all radiological medical needs, including:
- A- X-ray table moves in four directions and bears a patient weight of up to 150 kg, equipped with a buckle that accepts all film sizes with electromagnetic brakes.
- B- A variety of remote-controlled X-ray table (18-90) (20 -90) (90 -90) that can be controlled from the control panel and bear a patient weight of up to 150 kg.
- C- Basic X-ray table with a movable table equipped with weeping that accepts all X-ray film measurements.
- D- Bucky photo shooting stand with adjustable height from 41 to 170 cm with electromagnetic brakes

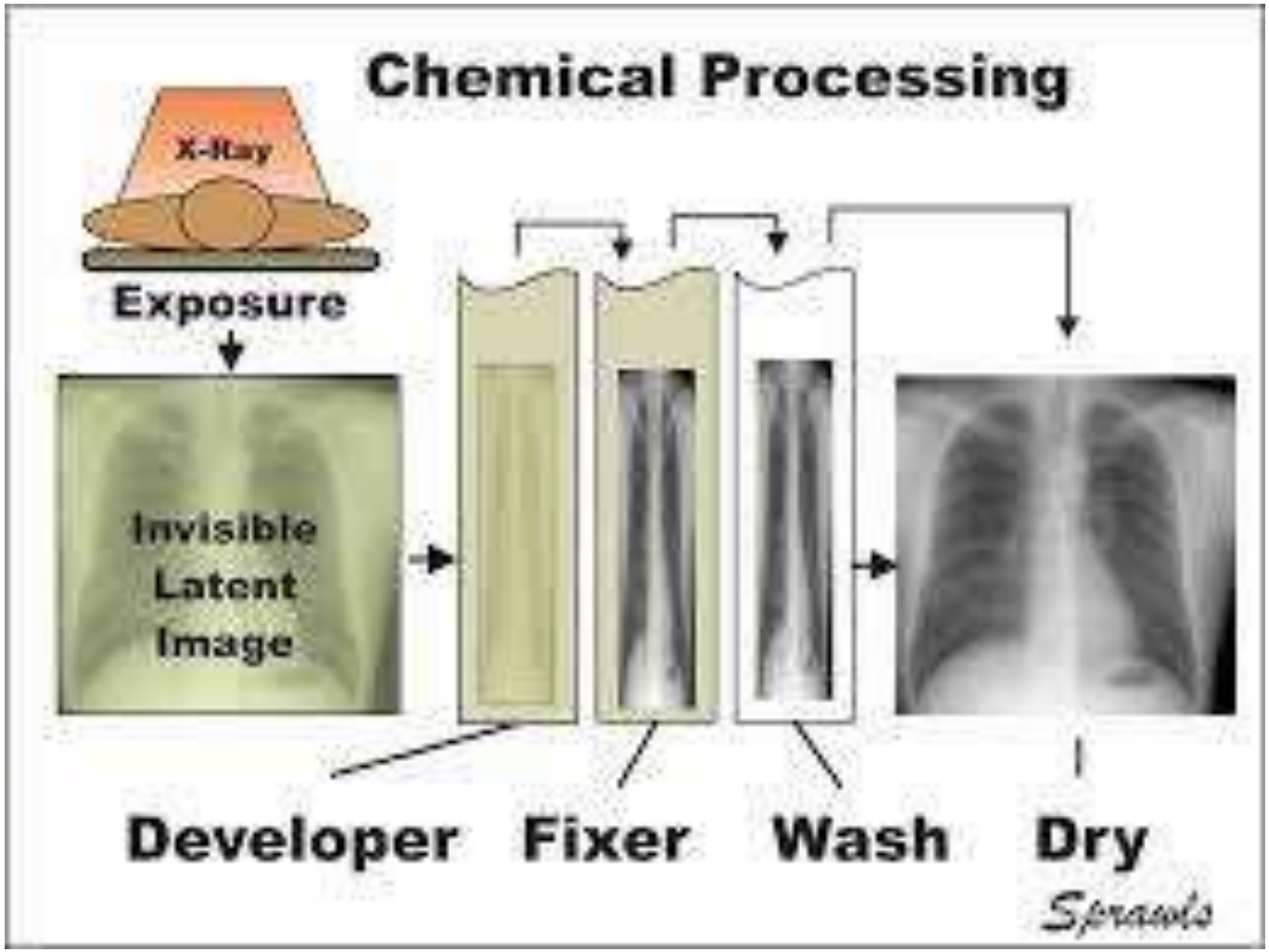
Film Processor

1- **Manual Film Processor**

2- **Automatic Film Processor**

1- **Manual Film Processor**

- The device consists of three basic pools: -
- 1- Solution Appearance: A substance used for bleaching or showing photographic films.
- 2- Fixed solution: The diamond materials that have not been exposed to light are removed from the film layers.
- 3- Wash: Wash the film with water to get rid of the desired materials and remaining on the surface of the film.
- The heated air dryer is added to it after the appearance is heated. The warming process begins (a heater in the appearance pool and the appearance must be heated before the warming process begins). The appearance shows the black areas in the film that are sensitive to the radiation, then the fixer shows the blue areas that are not sensitive to the radiation. After that, the water washes the film and removes the acids attached to the film (fixed
- And appearance), and its dried wail that expels hot air to dry the film


Chemical Processing
X-Ray
Exposure
Invisible
Latent
Image
Developer
Fixer
Wash
Dry
Sprawls

2- **Automatic Film Processor**

- 1- Film Transport Section .
- 2- Developer Section.
- 3- Fixer Section.
- 4- Wash Section .
- 5- Dryer Section .