

# *Physics of Medical Devices*

## *Tenth Lecture*

### *Defibrillator Device*

*Asst.Prof.Dr. Saba Abdulzahra Al-Rubae*

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*Al-Mustaqbal University*

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# *Defibrillator Device*



شكل (٣.١) جهاز إنعاش القلب (الصدمة الكهربائية) Defibrillator

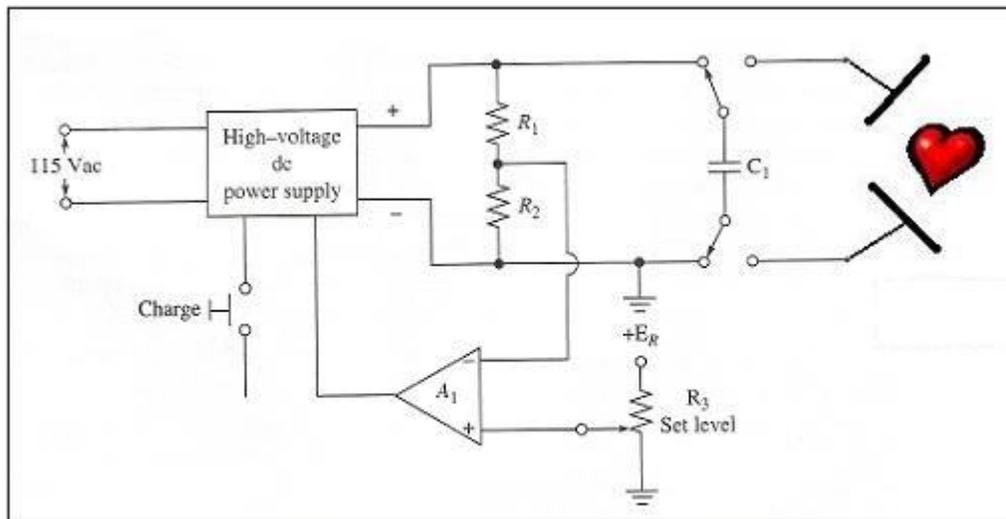
The Defibrillator device (electric shocks) is one of the most important devices in hospitals and medical centers. By means of it, the atrial rhythm can be restored to the heart when an irregularity occurs in the work of the heart, which is scientifically called ( Cardiac Arrhythmias), or when the heart stops completely or suddenly. By using the cardiopulmonary resuscitation device, the heart returns to doing its role regularly.

## *How does a Defibrillator device work?*

Works by firing an electric shock through **Paddles** Attached to the patient's body, this electric shock causes all muscle cells to contract momentarily, and then the heartbeat is corrected or restored .

We obtain the electric shock by storing the electrical energy in a capacitor through a high source of continuous voltage difference through a source of power or an internal battery. The charging process continues for several seconds until the alarm

sound is heard. Until it is proven that the charging process has been completed and the capacitor is ready for use. After that the condensate is discharged into the patient's body through **Paddles**.



شكل (٣,٢) الدائرة الإلكترونية الأساسية لجهاز إنعاش القلب

The energy stored in the capacitor ranges from 50–300 Joule

$$E = \frac{C.V^2}{2} \quad (1)$$

The capacitance of a capacitor can be calculated from the following equation:

$$C = \frac{2E}{V^2} \quad (2)$$

**Where :**

E: Stored energy is expressed in units of joules or watts per second. ( Watt-Second)

C: Capacitance: It is measured in farads ( F).

V: voltage across the capacitor : It is measured in volt (V).

### **Defibrillator Analyzer**

It is a device that analyzes the performance of the Defibrillator device by discharging the charge in it, meaning that it replaces the patient. The device has an internal resistance of 50 ohms, which is equivalent to the lowest resistance of the human body .

The most important functions of the Defibrillator device

are: **1- Measurement of the discharged energy value**

**2- Measure the voltage**

**value 3- Measure the**

**current value 4- discharge**

**time**

**5- Store the waveform with the possibility of drawing it**

### **❖ Security and safety procedures for Defibrillator**

#### **device users:**

**1-** Clean the two Paddles of jelly or cream to keep them dry.

**2-** Do not touch the discharge device containing the charge when discharging the electric shock.

**3-** Not to discharge the charge and the two ends in the air.

**4-** Not discharging the charge and the two sides are attached .