


**EXPERIMENT PROCEDURE:**

- Record the anode current/anode voltage characteristics for a thermionic triode at various constant grid voltages.
- Record the anode current/grid voltage characteristics for a thermionic triode at various constant anode voltages.

**OBJECTIVE**

Record characteristics for a thermionic triode.

**SUMMARY**

In a thermionic triode, free electrons carry a flow of current between the heated cathode and the anode when a positive voltage is applied between the cathode and anode. This current can be controlled by applying a positive or negative voltage to an intervening grid.

**REQUIRED APPARATUS**

| Quantity | Description  | Number                        |
|----------|--|-------------------------------|
| 1        | Teltron™ triode  | U18551                        |
| 1        | Teltron™ tube holder   | U18500                        |
| 1        | Power supply, 500 V DC, for 230 V AC<br>Power supply, 500 V DC, for 115 V AC | U210501-230 or<br>U210501-115 |
| 1        | DC Ammeter, 10 mA, e.g.  | U17451                        |
| 1        | DC Voltmeter, 10 V, e.g.   | U17450                        |
| 1        | Set of 15 safety patch cords, 75 cm  | U13802                        |

# Thermionic Triode

## BASIC PRINCIPLES

A thermionic triode is an evacuated glass tube that contains three electrodes, a heated cathode that emits electrons due to the thermo-electric effect and an anode with a grid placed in between them. At sufficiently high positive voltage between the cathode and anode (anode voltage), free electrons from the cathode can pass through the grid to reach the anode. The anode current generated in this way can be modulated by varying another voltage between the cathode and the grid. Depending on whether the grid is at positive or negative potential to the cathode, the anode current is either amplified or weakened. A thermionic triode can thus be used for amplifying AC voltages.

This experiment involves recording the set of characteristics for a thermionic triode. These incorporate the way the anode current  $I_A$  depends on the anode voltage  $U_A$  and on the grid voltage  $U_G$ . There are two common ways of portraying these characteristics (see Figs. 2 and 3): Fig. 2 shows the anode current as a function of the anode voltage at various constant grid voltages and Fig. 3 shows the anode current as a function of the grid voltage at various different constant anode voltages.

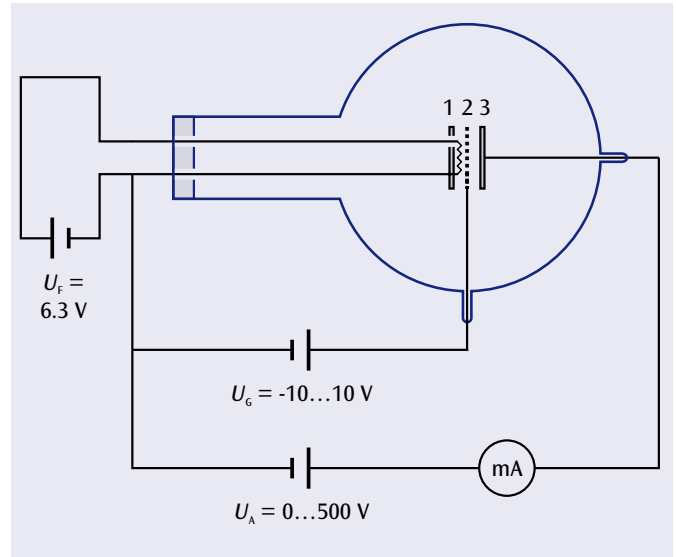


Fig. 1: Circuit for recording the characteristics of a thermionic triode  
1: Cathode, 2: Grid, 3: Anode

## EVALUATION

The anode current rises as the anode voltage or the grid voltage rises. Even slight changes in the grid voltage of the order of a few volts can lead to large variations in the anode current. The grid voltage can thus be used to control the anode current.

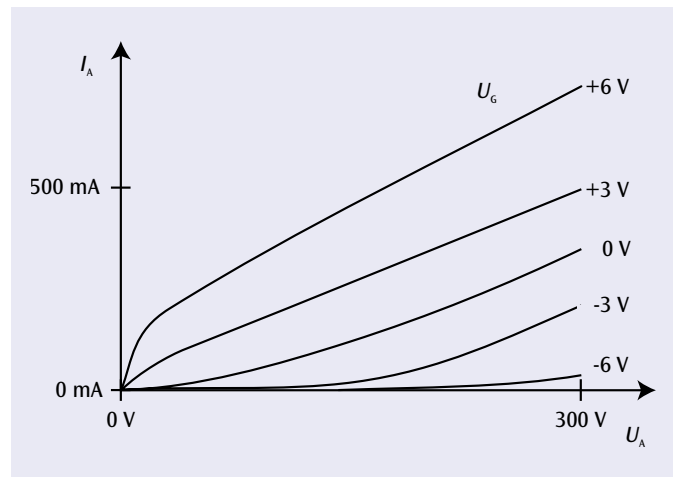


Fig. 2: Anode current/anode voltage characteristics

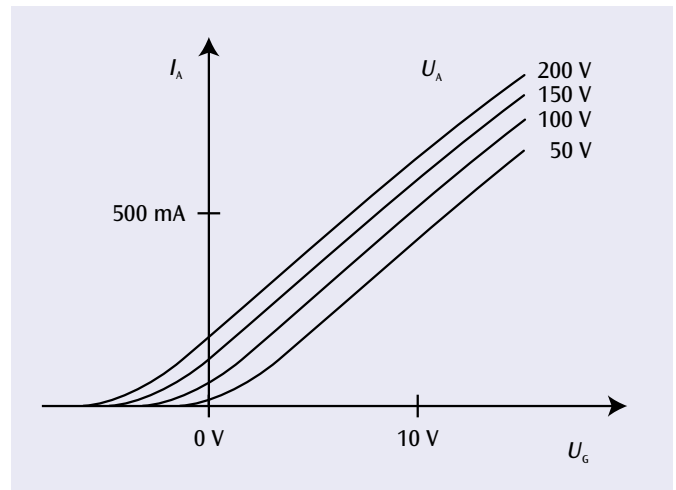


Fig. 3: Anode current/grid voltage characteristics