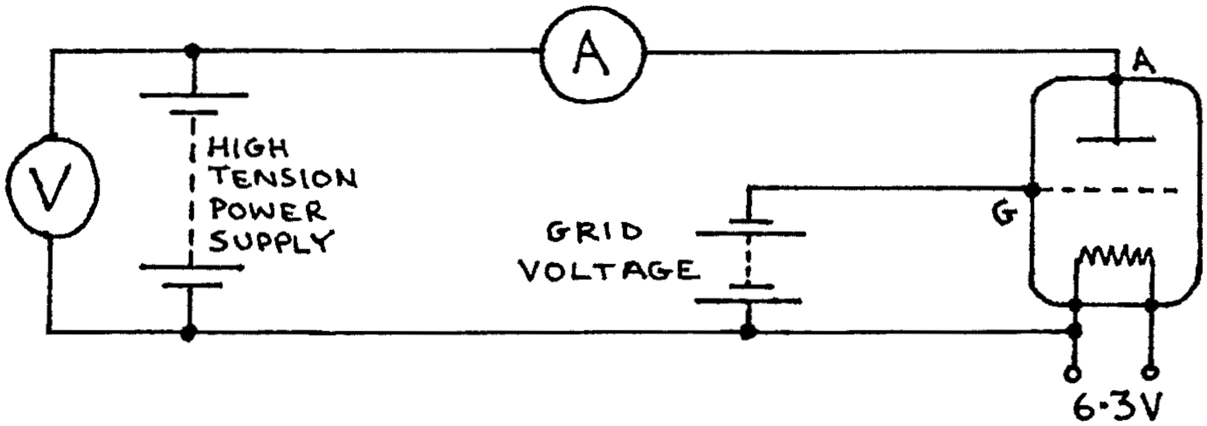
G1-1: Measuring Triode Characteristics

Apparatus

DC power supply 0–800V; voltmeter 0–800V; cathode heater circuit (in power supply); planar triode (e.g.: TEL 521); 6 dry cells as grid voltage source; sensitive ammeter 0.01–0.8mA; 9 connecting wires; 2 sheets of graph paper.



Procedure

1. Check the circuit to see it agrees with the drawing above. The power supply is off. Always be certain the power supply is off before you change circuit connections. Failure to do this may cause injury or damage to the equipment.

2. Set the grid voltage at −9V (six dry cells in series). Set the power supply dial at zero. Turn on the power supply and slowly increase the anode potential by turning the power supply dial until the voltmeter shows 100V. Record anode potential, V_a, and anode current, I_a, for V_a = 100, 200, 300, 400, 500, and 600V.

   NOTE the ammeter while you increase the anode potential. If the ammeter goes off scale, STOP increasing the potential difference and go on to the next step.

   Turn the power supply off.

3. Change the grid potential, V_g, to -6V then repeat procedure (2).
4. Change V_g to - 4.5V and repeat procedure 2.
5. change V_g to -3V and repeat procedure 2.
6. Change V_g to -1.5V and repeat procedure 2.
7. Make 5 more data tables of V_g and I_a, with V_a constant. Use the data from the procedure above for V_a = 100, 200, 300, 400, and 500V.

Observations

Tabulate:

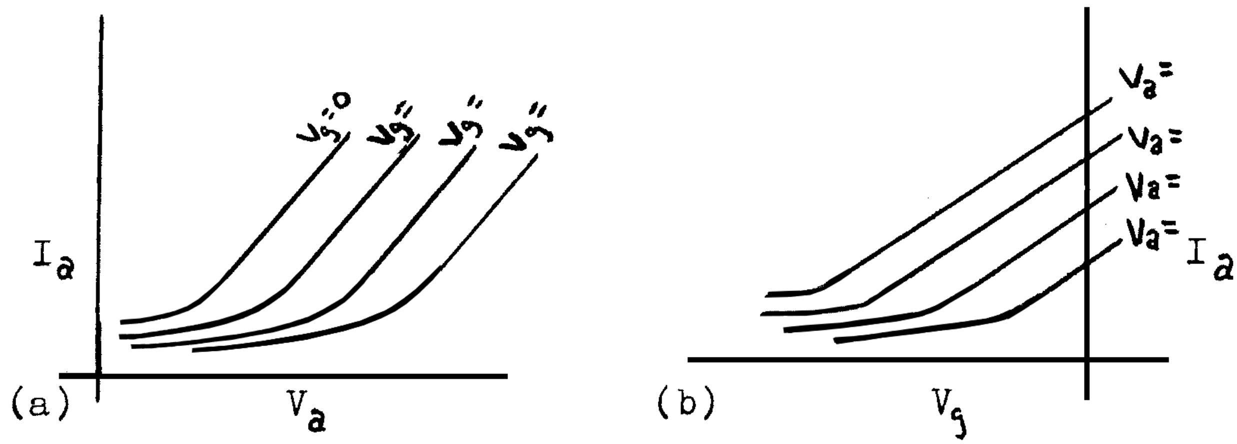
I_a and V_a for each of the 5 values of V_g constant:
note V_g in volts for each table

I_a mA	V_a volts

I_a and V_g for the first 5 values of V_a constant:
note V_a in volts for each table

I_a mA	V_g volts

Theory



From the slope of the linear part of graph (a) the anode resistance is:

$$R_a = \frac{\delta V_a}{\delta I_a} \text{ when } V_g \text{ is constant}$$

From the linear part of graph (b), the mutual conductance, g_m, is:

$$g_m = \frac{\delta I_a}{\delta V_g} \text{ when } V_a \text{ is constant}$$

The amplification factor, μ, can be found by comparing V_a and V_g over similar intervals of I_a on the graphs:

$$\mu = \frac{\delta V_a}{\delta V_g} \text{ over the same interval } I_a$$

$$\text{or: } \mu = g_m R_a$$

Analysis

1. Plot I_a vs. V_a for all values of V_g on the same axes.
2. Plot I_a vs. V_g for all values of V_a on the same axes.
3. From your graphs find R_a, g_m, and μ.