CHAPTER IV

RESULTS

Characteristics of Ground Water

The ground water used in the experiment has been obtained from The Royal Grand Palace in Bangkok, Thailand. The characteristics of the ground water are shown in Table IV. The range of iron content of the raw water is from 2.0 to 2.7 ppm., pH from 6.7 to 7.3 and the chloride contents from 565 to 759 ppm., which are in the normal range of ground water in Bamgkok.

Table III. Charecteristics of ground water

Compositions	Date of Sampling	
	5 Nov.1973	8 Nov.1972
Methyl orange alkalinity	-	224.0
Total solids	-	1852.0
Dissolve solids	-	1250.0
Total hardness	694	580.0
Carbonate hardness	210	224.0
Non carbonate hardness	-	356.0
Chloride, expressed as Cl	759	565.0
Sulphate, expressed as Na_2SO_4	125.13	157.62
Nitrate, expressed as Nitrogen	0.006	0.02
Nitrite, expressed as Nitrogen	0.106	0.010
Calcium	-	144.0
Iron	2.7	2.0
pH	7.3	6.7
Mg	-	52.8

All value express in ppm.

(Data from Laboratory Department, Metropolitan Water Works Authority)

Characteristics of Synthetic Water

The synthetic water was proposed by dissolving ferrous sulfate ($FeSO_4.7H_2O$) in tap water. The compositions of synthetic water are shown in table V.

Table V. Characteristics of Synthetic Water

Iron, Mg/l as Fe^{+2}	2.4
Alkalinity, Mg/l as $CaCl_3$	106.6
Hardness, Mg/l as $CaCO_3$	45
pH	7.1
Temp. °C	27°
Conductivity	4.5

This synthetic water was being used to identify the type of iron content in the water that was removed after passing through the electric field column by abserving the precipitate of iron.

Flow Rate and Percentage of Iron Removal

The relationship of flow rate and percentage of iron removal at various wattages of powersupplied are shown in fig.17, 18 and 19.

In fig.17 the percentage of iron removal are plotted with various flow rate of influent ground water. The power supplied was fixed at 20 watts during the run. The curve shows the maximum percentage of iron removal of 99.4% at a flow rate of 0.5 1/min. It is also shown a decreasing percentage of iron removal with the increasing of influent flow rate.

The relations between percentage of iron removal and flow rate of influent ground water at 40 watts power supplied are shown in fig.18. The curve shows the maximum percentage of iron removal of 99.9% at flow rate of 1 1/min and the minimum percentage of iron removal of 61.6% at flow rate of 5 1/min. A decreasing percentage of iron removal with the increasing influent flow rate is also obtained.

The percentage of iron removal and flow rate of influent water, at 60 watts power supplied are shown in fig. 19. The maximum percentage of iron removal is 99.9% at flow rate of 2 1/min and a minimum percentage of iron removal is 62.8% at the flow rate of 6 1/min. A percentage of iron removal is decreased by the increasing of influent flow rate is also observed.

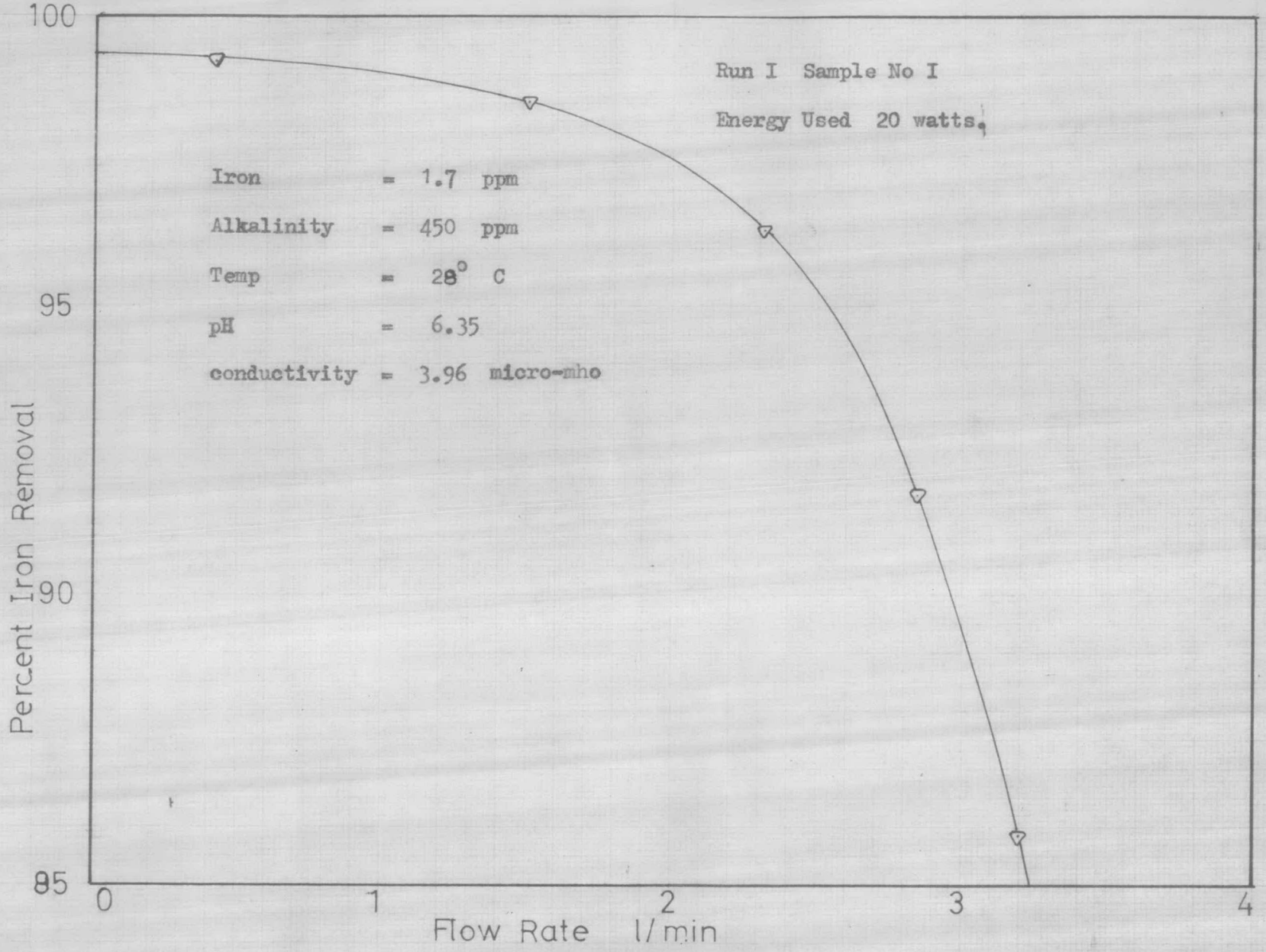


Fig. 17 Flow Rate and Percent Iron Removal Curve.

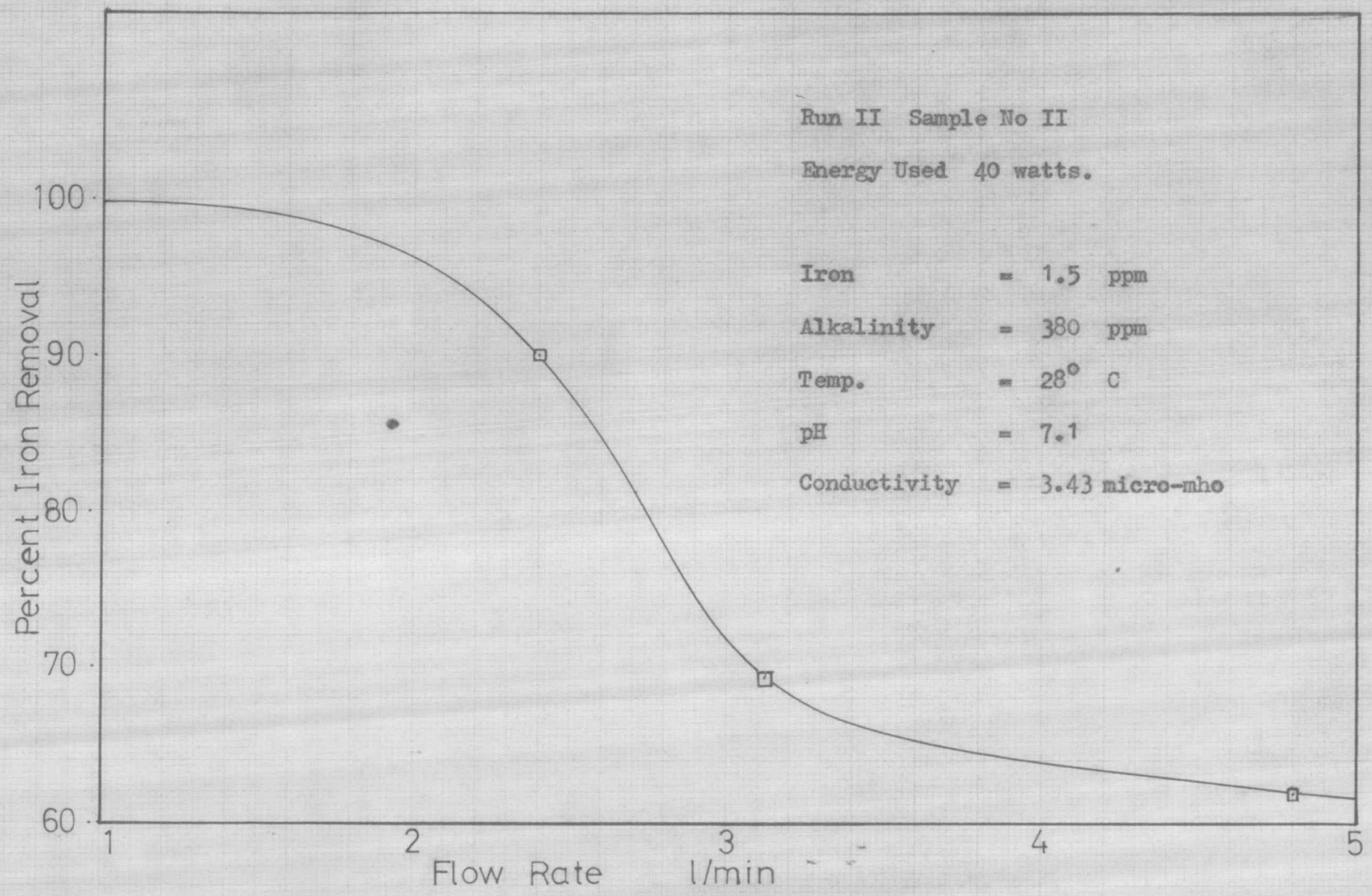


Fig. 18 Flow Rate and Percent Iron Removal Curve

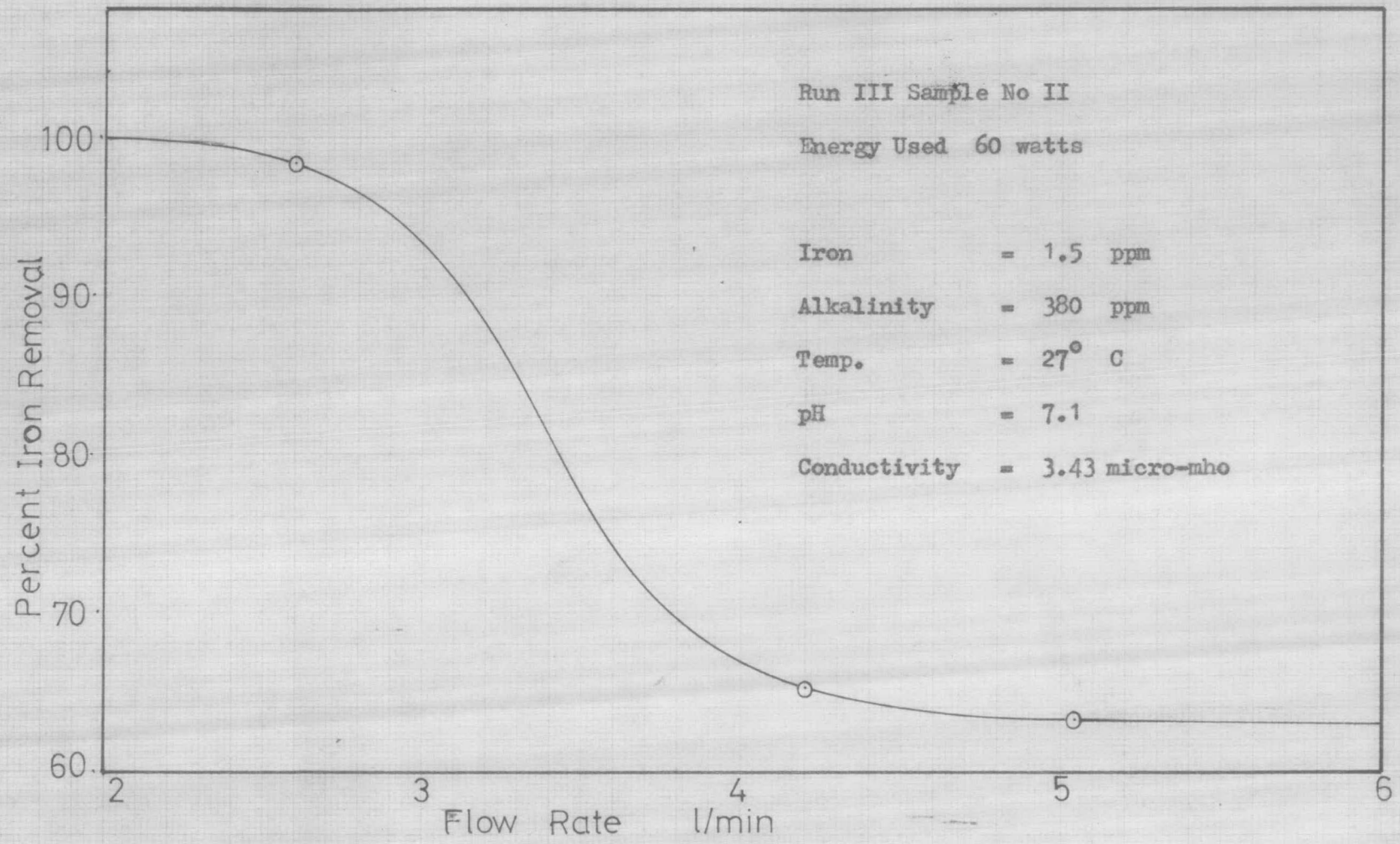


Fig. 19 Flow Rate and Percent Iron Removal Curve

Energy Use and Percentage of Iron Removal

The relationship between energy use and percentage of iron removal from synthetic water and natural ground water are shown in fig.20 and 21 respectively.

In fig.20 the synthetic water which has 2.4 ppm iron content was passed through the electric field column at the flow rate of 0.698 1/min. The energy use was varied from 40 to 260 watts. The percentage of iron removal are shown to be increased with the increasing of energy use, for example, the percentage of iron removal was 96% at 80 watts and 99.5% at 240 watts. All the residual iron is measured after a retention time of 5 hrs.

In fig.21 the natural ground water, which has 1.5 ppm iron content, was passed through the electric field column at a fixed flow rate of 2.4 1/min. The energy use was varied from 20 to 80 watts. The percentage of iron removal are also shown to be increased with the increasing of energy use. All the residual iron is measured after a retention time of 120 min.

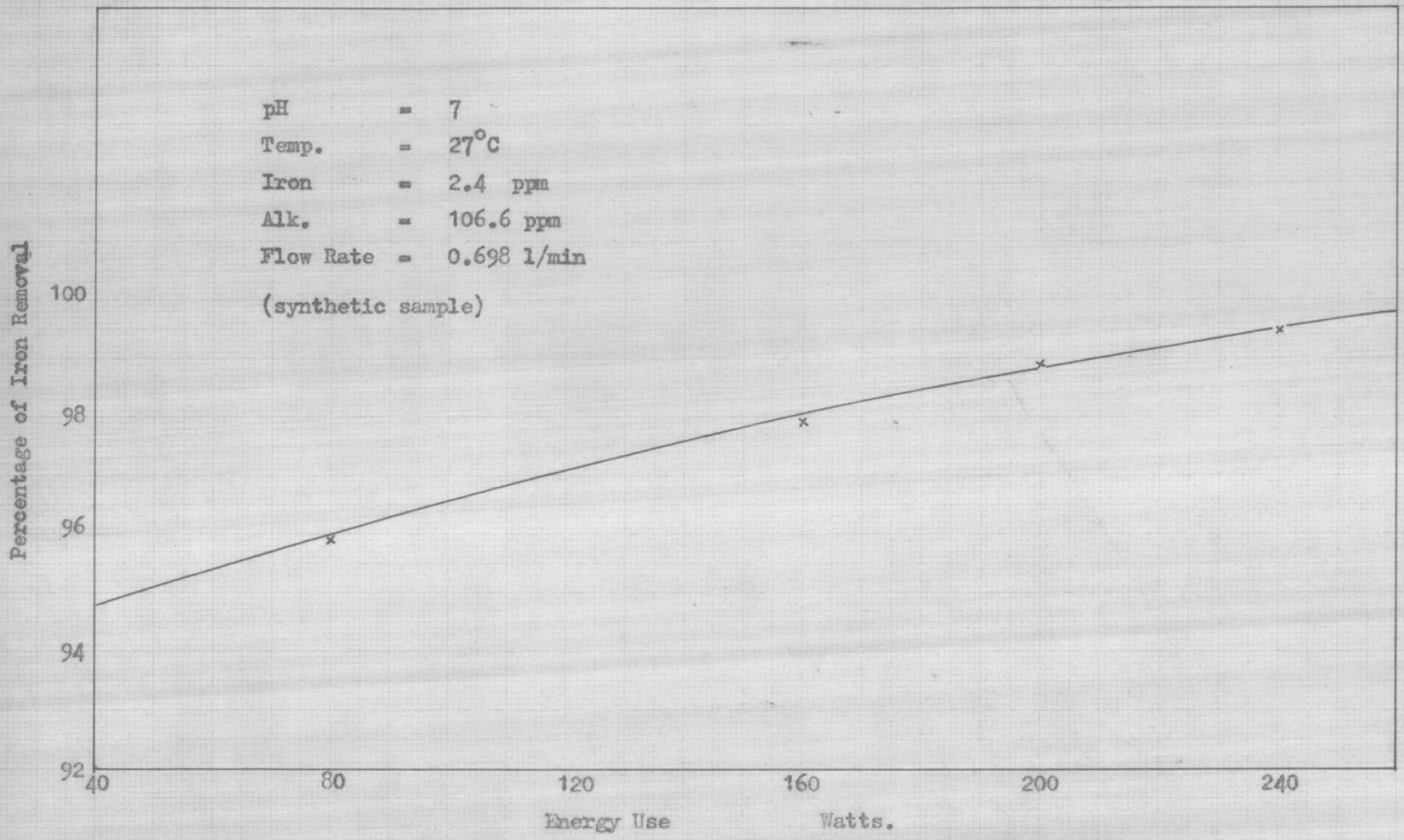


Fig. 20 Energy Use and Percentage of Iron Removal Curve

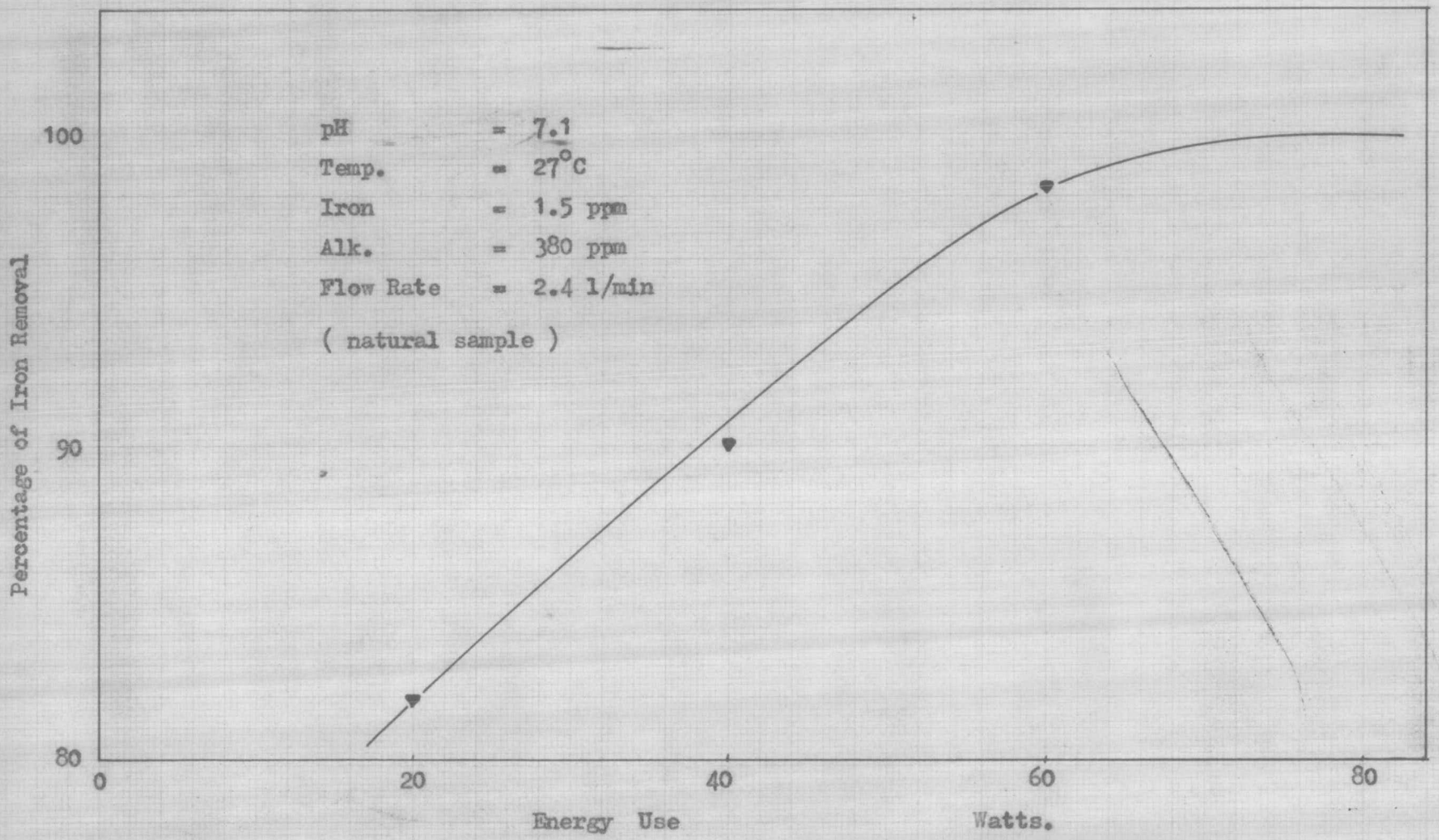


Fig. 21 Energy Use and Percentage of Iron Removal Curve

Flow Rate and Effluent Water Temperature

The flow rate and effluent ground water temperature are plotted in fig.22 and 22a.

In fig.22 the influent and effluent temperature of underground water was plotted against the flow rate at energy use of 20 watts. The influent water temperature is constant at 28°C. The effluent temperature was decreased by the increasing of flow rate for exsample at the flow rate of 1 l/min the effluent temperature is 45.25°C and at flow rate of 3 l/min the effluent temperature is 34°C.

In fig.23 the influent and effluent temperature of underground water was plotted against the flow rate at energy use of 40 watts and the influent temperature of 28°C. The effluent temperature was also decreased by the increasing of flow rate.

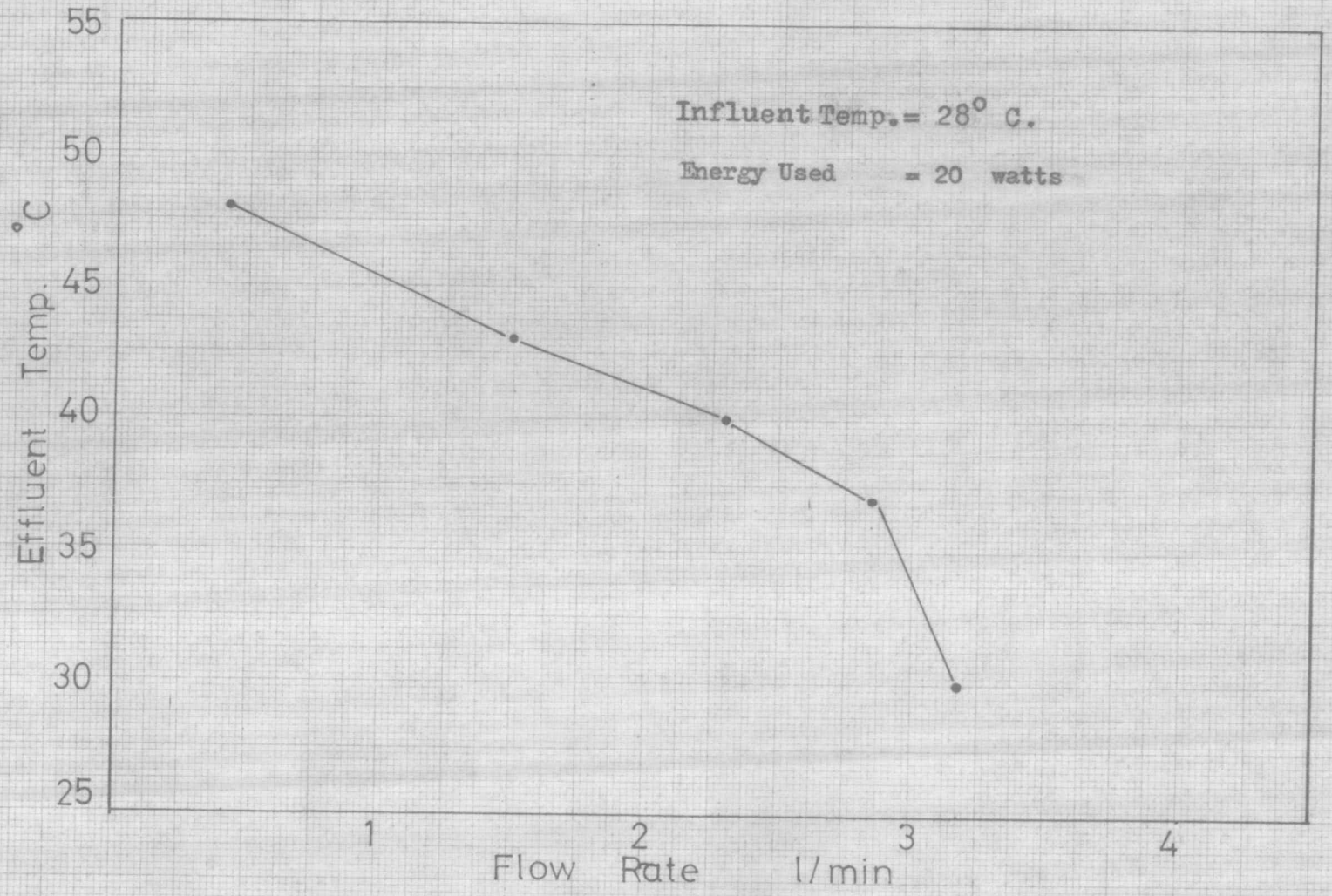
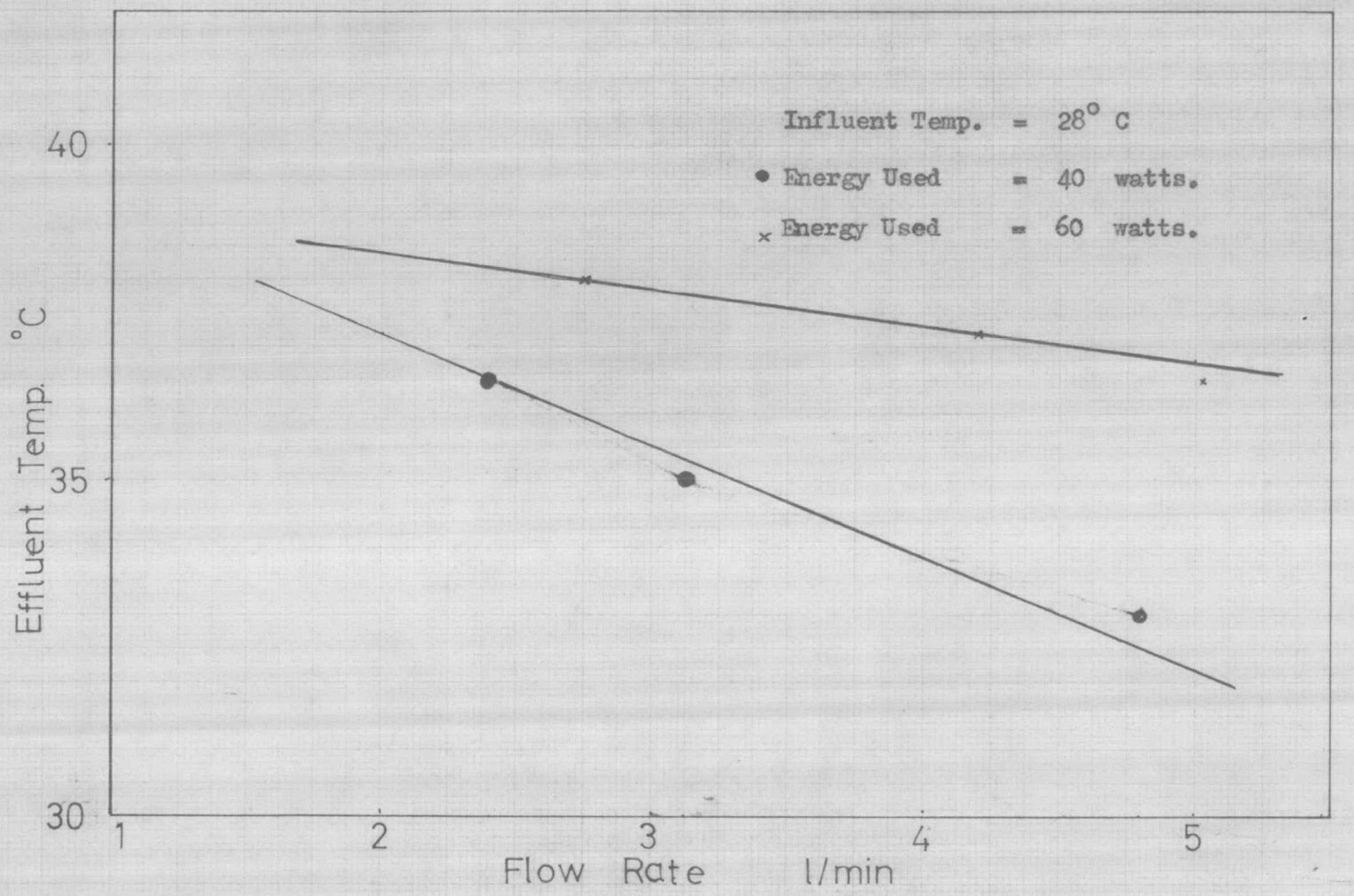


Fig. 22 Flow Rate and Effluent Temp. Curve



Fig, 22 a. Flow Rate and Effluent Temp. Curve

Conductivity and Percentage of Iron Renoval

The relationship of conductivity and percentage of iron removal is shown in fig.26. At flow rate of 1 l/min and energy use of 40 watts, the conductivity of 4.50 mV the percentage of iron removal is 94.8% and at conductivity of 3.96 mV the percentage of iron removal is 99.7%. It means that lower conductivity give higher percentage of iron removal.

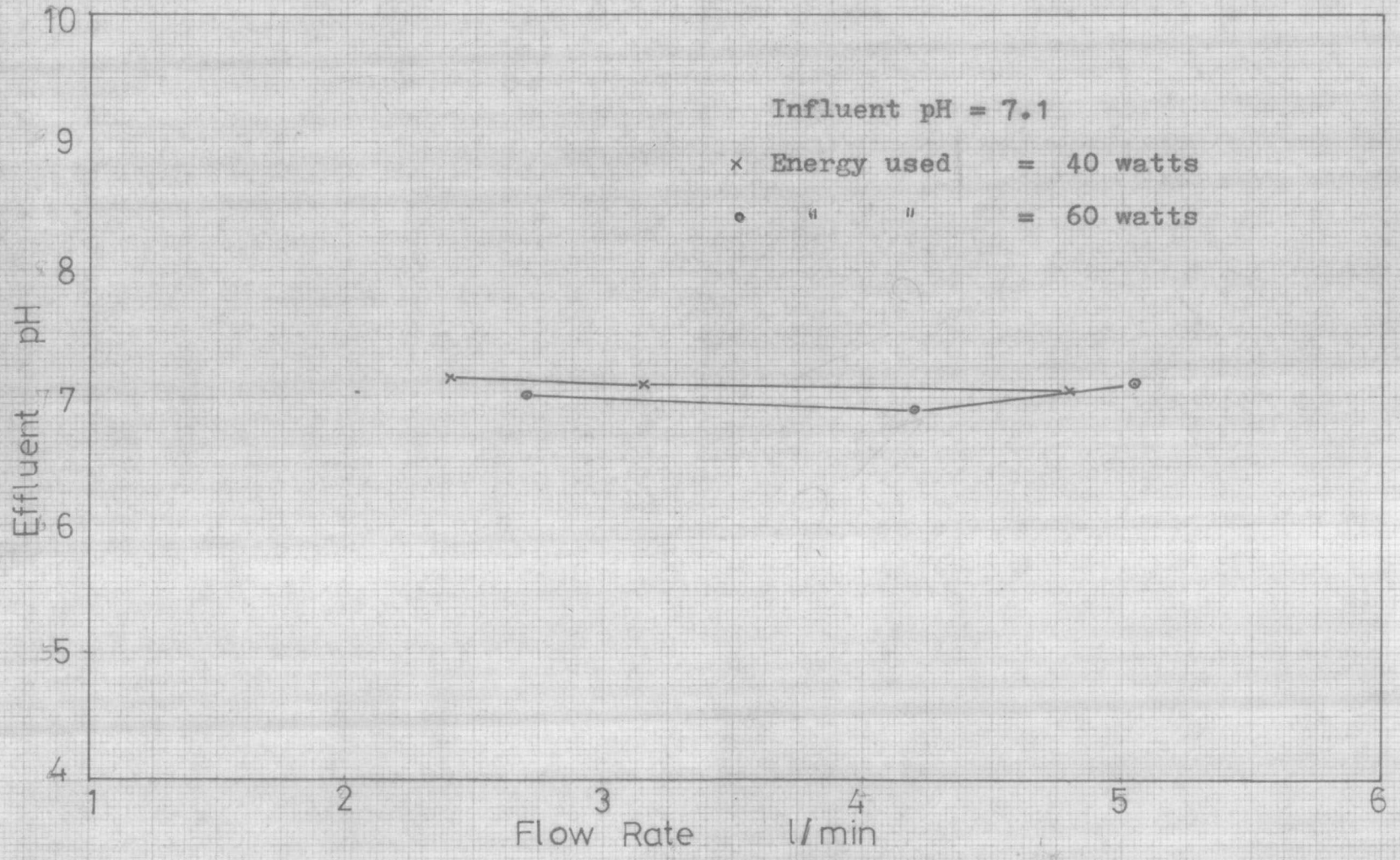
Flow Rate and Effluent pH

The pH of the effluent water at various rate of flow with power supplied of 20 and 40 watts. and plotted in fig.23 and 24.

The influent pH are 7.1 and 6.35 respectively. These curves show slightly change of the pH of the effluent ground water from the influent pH.

Alkalinity and Percentage of Iron Renoval

The alkalinity and percentage of iron renoval are plotted in fig.25. At the flow rate of 0.698 l/min and energy use of 60 watts, the influent alkalinity of 100 ppm give percentage of iron renoval of 95.75% while the influent alkalinity of 350 ppm increased the percentage of iron renoval to 99.5%.



Fig, 23 Flow Rate and Effluent pH Curve

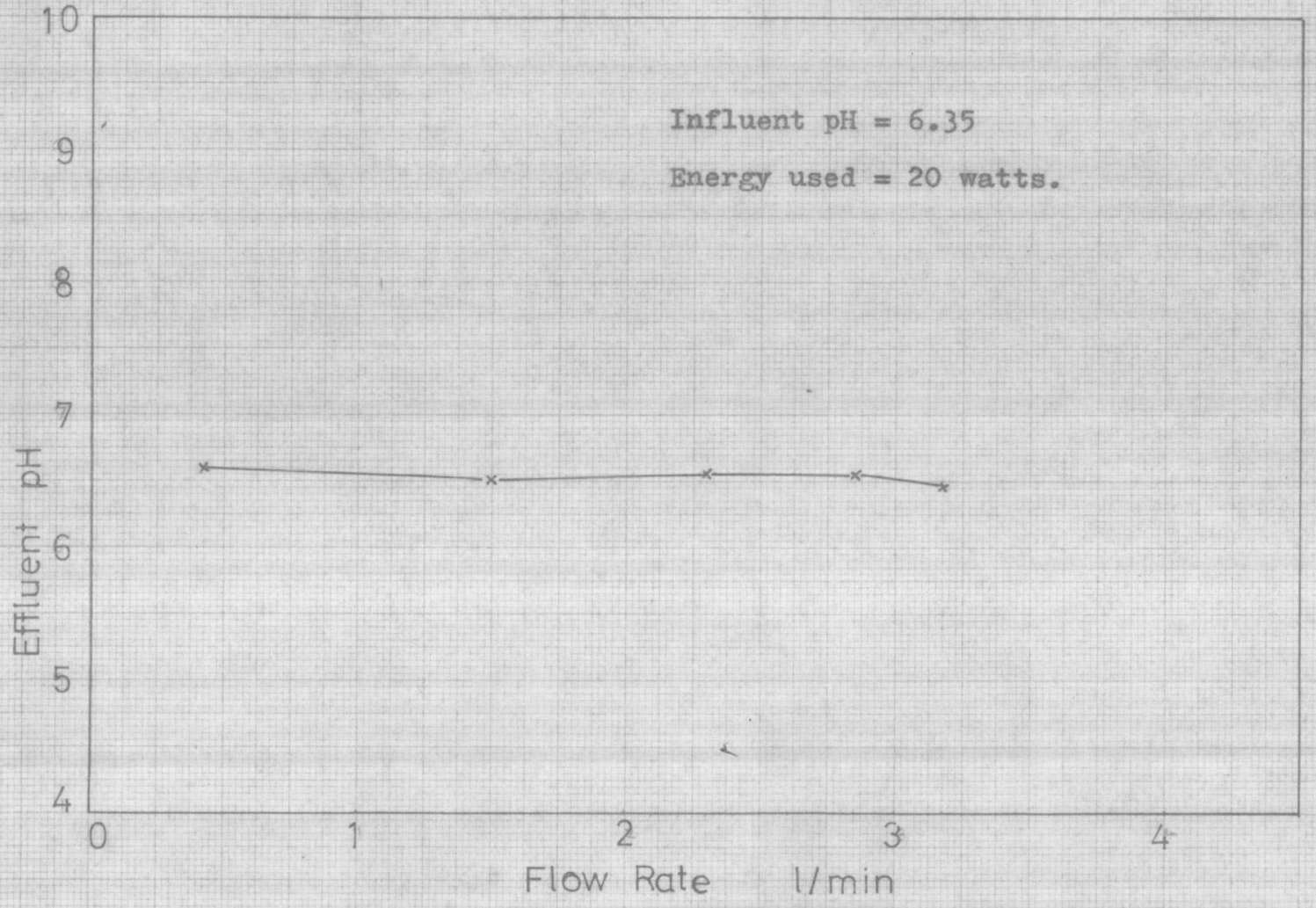


Fig. 24 Flow Rate and Effluent pH Curve.

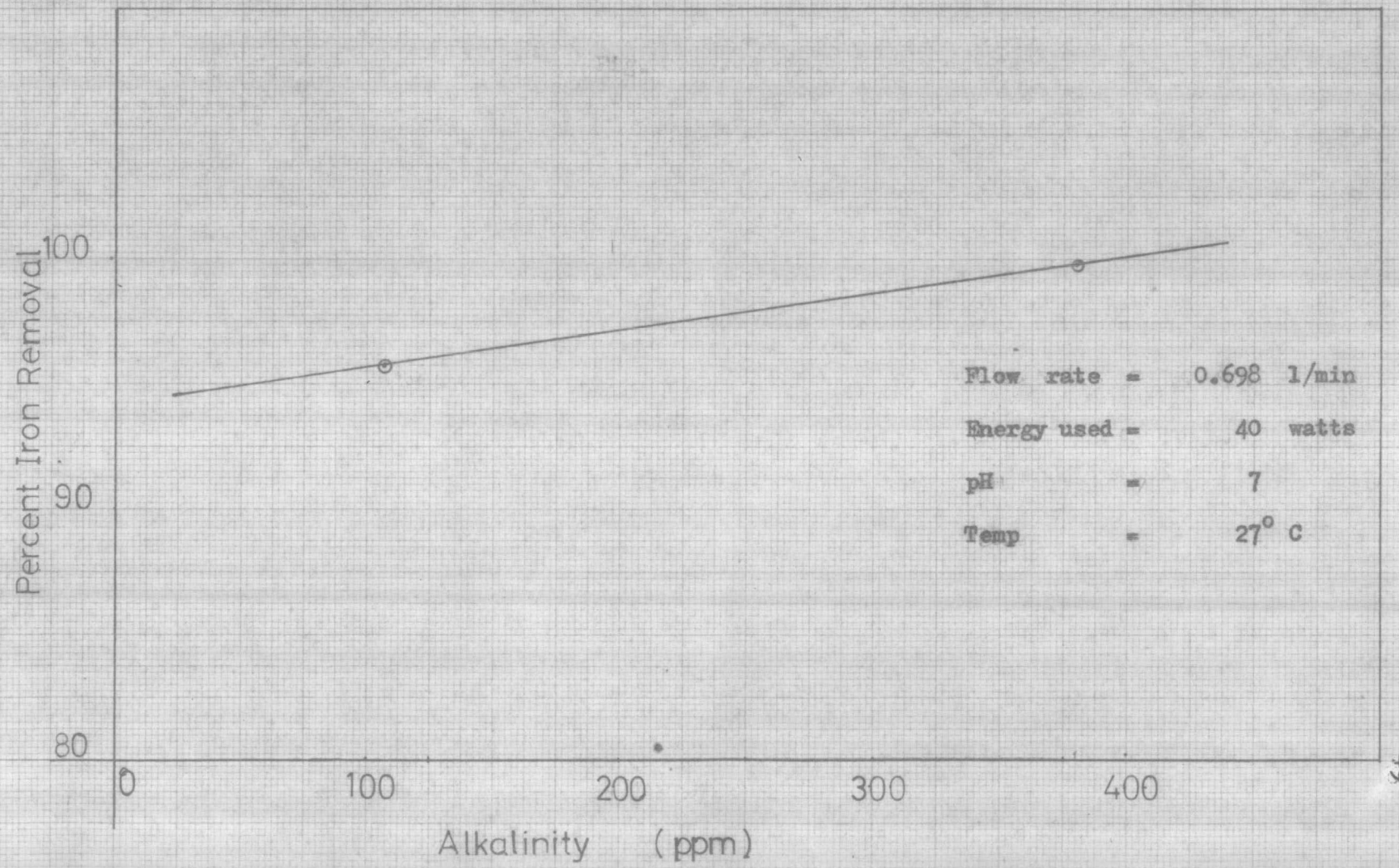


Fig. 25. Alkalinity and Percent Iron Removal Curve

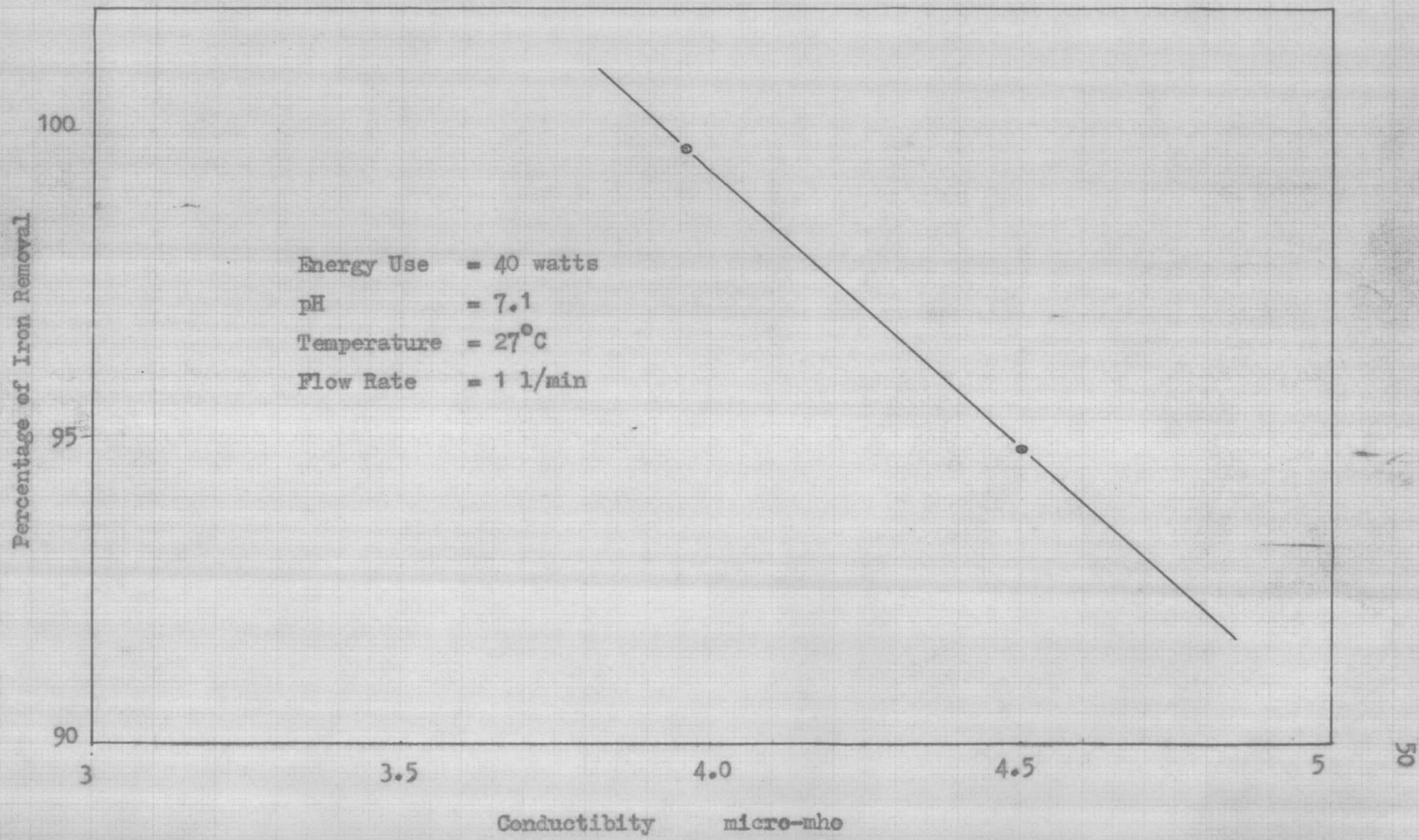


Fig. 26. Conductivity and Percentage of Iron Removal