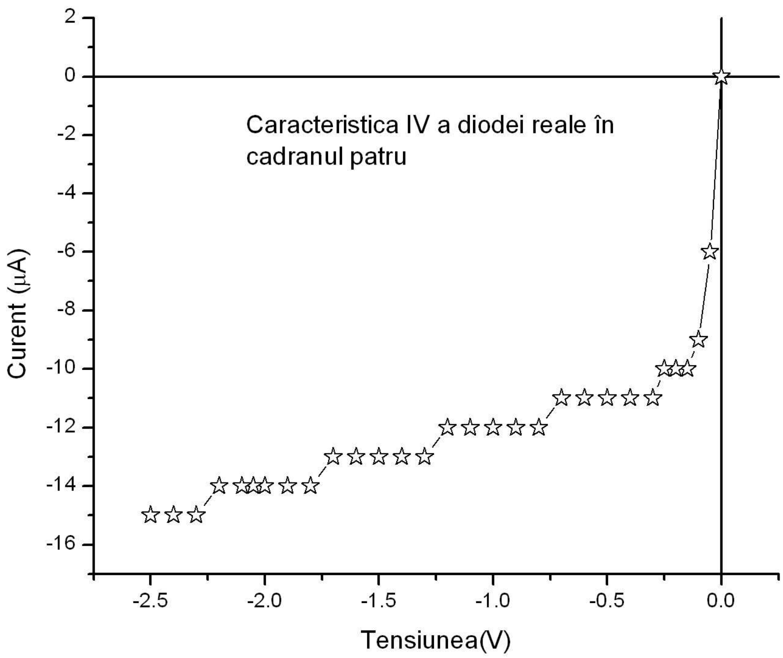
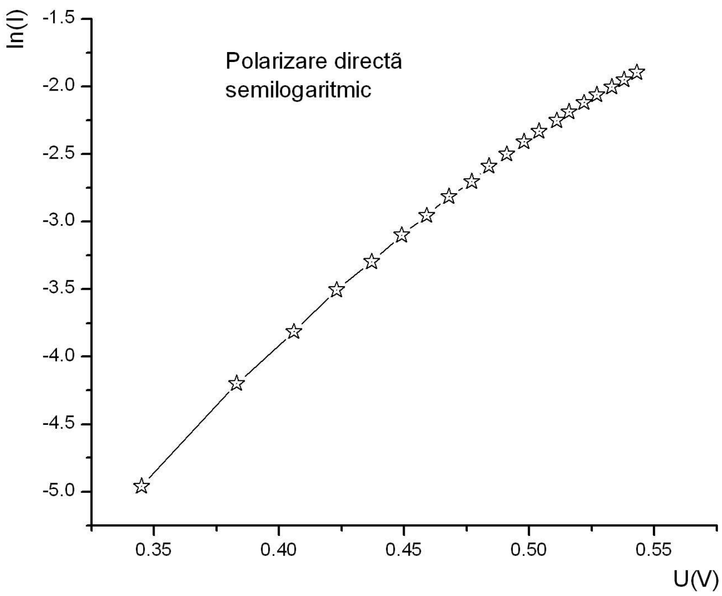
Evaluation Sheet

Any other correct solution will be evaluated accordingly

No.	*Experimental problem 1*	Points
1.	**For:** $I = -I_0 \cdot + \frac{V}{R}$ 0.4p	**0.4p**
2.	**For:**  0.6p	**0.6p**
3.	**For:** Linear expression of the $I - V$ characteristic for reversed polarity $I = \frac{V}{R} - I_0$ 0.2p $a = 1/R$ 0.2p $b = -I_0$ 0.2p	**0.6p**
4.	**For:** correctly filling in the Table 3 0.8p	**0.8p**

5.	**For:** the slope of the fitting line $a = \dfrac{10\sum_{i=1}^{10} U_i \cdot I_i - \sum_{i=1}^{10} U_i \cdot \sum_{i=1}^{10} I_i}{10 \cdot \sum_{i=1}^{10} U_i^2 - \left(\sum_{i=1}^{10} U_i\right)^2}$ 0.4p $a = \dfrac{10 \cdot 298.8 - 20.95 \cdot 142}{10 \cdot 44.49 - (20.95)^2} = \dfrac{13.1}{5.99}\dfrac{\mu A}{V} = 2.18 \times 10^{-6}\dfrac{A}{V}$ the slope-intercept of the fitting line $b = \dfrac{\sum_{i=1}^{10} U_i^2 \cdot \sum_{i=1}^{10} I_i - \sum_{i=1}^{10} U_i \cdot \sum_{i=1}^{10} U_i \cdot I_i}{10 \cdot \sum_{i=1}^{N} U_i^2 - \left(\sum_{i=1}^{N} U_i\right)^2}$ 0.4p $b = \dfrac{44.49 \cdot (-142) - (-20.95) \cdot 298.8}{5.99} = \dfrac{-57.72}{5.99}\mu A = -9.6\mu A$	**0.8p**
6.	**For:** the correlation coefficient for the presumed linear dependency $G = \dfrac{10 \cdot \sum_{i=1}^{10} U_i \cdot I_i - \sum_{i=1}^{10} U_i \cdot \sum_{i=1}^{10} I_i}{\sqrt{\left\lvert 10 \cdot \sum_{i=1}^{10} U_i^2 - \left(\sum_{i=1}^{10} U_i\right)^2 \right\rvert \cdot \left\lvert 10 \cdot \sum_{i=1}^{10} I_i^2 - \left(\sum_{i=1}^{10} I_i\right)^2 \right\rvert}}$ 0.4p $G = \dfrac{10 \times 298.8 - 20.95 \times 142}{\sqrt{5.99 \times 36}} = \dfrac{13.1}{14.6} \cong 0.90$	**0.4p**
7.	**For:** $I_0 = 9.6\mu A$ 0.4p $R = \dfrac{1}{a} \cong 460 k\Omega$ 0.4p	**0.8p**
8.	**For:** $I = I_0 \cdot e^{\frac{q(V - r \cdot I)}{\eta \cdot k_B \cdot T}}$ 0.4p	**0.4p**
9.	**For:** $\ln(I) = \ln(I_0) + \dfrac{q(V - rI)}{\eta k_B T}$ 0.2p for experimental data within the range $V > rI$ $\ln(I) = \ln(I_0) + \dfrac{qV}{\eta k_B T}$ 0.2p	**1.0p**



0.6p

10. **For:** **0.8p**

correctly filling in table 4 — 0.8p

11. **For:** **0.8p**

the slope of the fitting line

$$a=\frac{10\sum_{i=1}^{10}U_i\cdot\ln(I_i)-\sum_{i=1}^{10}U_i\cdot\sum_{i=1}^{10}\ln(I_i)}{10\cdot\sum_{i=1}^{10}U_i^2-\left(\sum_{i=1}^{10}U_i\right)^2}$$

0.4p

$$a=\frac{10\cdot(-12.493)+(4.857)\cdot(25.849)}{10\cdot(2.363)-(4.857)^2}=\frac{0.6185}{0.0395}=15.66$$

the slope-intercept of the fitting line

$$b=\frac{\sum_{i=1}^{10}U_i^2\cdot\sum_{i=1}^{10}\ln(I_i)-\sum_{i=1}^{10}U_i\cdot\sum_{i=1}^{10}U_i\cdot\ln(I_i)}{10\cdot\sum_{i=1}^{N}U_i^2-\left(\sum_{i=1}^{N}U_i\right)^2}$$

0.4p

$$b=\frac{(2.363)\cdot(-25.849)+(4.857)\cdot(12.493)}{0.0395}=\frac{-0.403}{0.0395}=-10.15$$

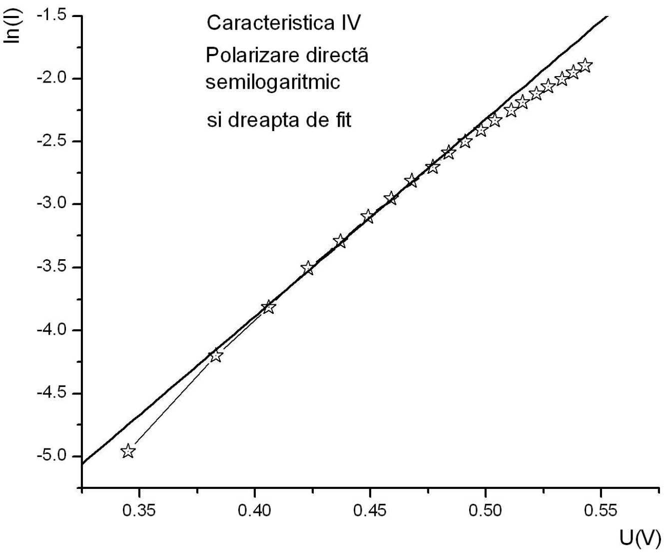
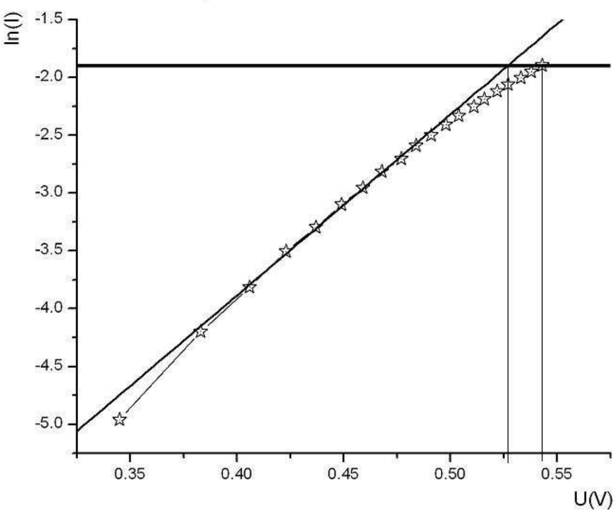
12. **For:** **0.4p**

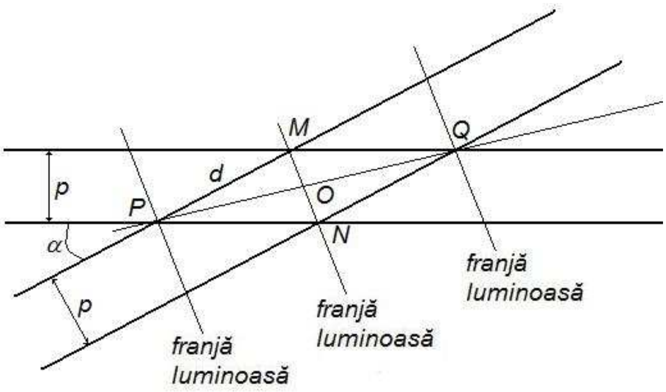
the correlation coefficient for the presumed linear dependency

$$G=\frac{10\cdot\sum_{i=1}^{10}U_i\cdot\ln(I_i)-\sum_{i=1}^{10}U_i\cdot\sum_{i=1}^{10}\ln(I_i)}{\sqrt{\left|10\cdot\sum_{i=1}^{10}U_i^2-\left(\sum_{i=1}^{10}U_i\right)^2\right|\cdot\left|10\cdot\sum_{i=1}^{10}\left(\ln(I_i)\right)^2-\left(\sum_{i=1}^{10}\ln(I_i)\right)^2\right|}}$$

0.4p

$$G=\frac{0.6185}{\sqrt{0.04\cdot8.4}}\cong1$$

13.	**For:** 	0.6p	**0,6p**
14.	**For:** $\begin{cases} \eta = \dfrac{q}{a \cdot k_B T} \\ I_0 = e^b \end{cases}$	0.4p	**0.8p**
	$\begin{cases} \eta = \dfrac{38,64}{15,66} = 2.4 \\ I_0 = 3.7 \times 10^{-5} A \cong 30 \mu A \end{cases}$	0,4p	
15.	**For:**  $\Delta V = rI$ $0.02 = r \cdot 0.15$	0.6p	**0.6p**
16.	**For:** $r \cong 0.2\Omega$	0.2p	**0.2p**
TOTAL			**10p**

No.	*Experimental problem 2*		Points
A.	**For:**		**1.5p**
	the value of the period of the Moiré pattern: 23 u.a.	1.0p	
	the value of the period of the grid marked “Rigla, raportor, grila 2”: $p = \frac{1}{1/0.76 \pm 1/23}$	0.5p	
B.	the value of the period of the Moiré pattern: 23 u.a.	1.0p	**1.5p**
	the value of the period of the grid marked “Rigla, raportor, grila 3”: $p = \frac{1}{1/0.76 \pm 1/23}$	0.5p	
C.	**For:**		**1.0p**
	correct commentary regarding the possibility for a Moiré pattern to appear as a consequence of the usage of the grids indicated	1.0p	
D.	**For:**		**2.0p**
	the value of the period of the grid marked “Rigla, raportor, grila 2”: 0.79 u. a.	1.0p	
	the value of the period of the grid marked “Rigla, raportor, grila 3”: 0.73 u. a.	1.0p	
E.	**For:**		**2.0p**
		0.5p	
	$PO = d \cdot \cos\left(\frac{\alpha}{2}\right)$	0.5p	
	$PO = p \cdot \frac{\cos\left(\frac{\alpha}{2}\right)}{\sin\alpha}$	0.5p	
	$PO = \frac{p}{\sqrt{2}} \cdot \sqrt{\frac{1+\cos\alpha}{\sin^2\alpha}}$	0.5p	

F.	**For:** correctly filling in Table 1 1.0p	**1.0p**
G.	**For:** correctly filling in Table 2 1.0p	**1.0p**
TOTAL		**10p**