

**Travail écrit 1**  
**Procédés de fabrication - IGI 2 - HEIG-Vd (Prof.E.Boillat)**  
**Barèmes**

**EXERCICE 1**

<b>a)</b>	courbe réelle	1pt	1pt	page 1
<b>b)</b>	$\eta_e \rightarrow$ aire triangle $OBA$	1pt	1pt	
<b>c1)</b>	cycle de fort écrouissage	1pt	1pt	
<b>c2)</b>	$\varepsilon_{ult} \approx 0.223$ et $\varepsilon_{p;ult} \approx 0.207$ position correcte de $\varepsilon_{ult}$ et $\varepsilon_{p;ult}$ sur le graphe	1pt 1pt	2pts	
<b>c3)</b>	$\eta_{rel} \rightarrow$ aire triangle $PQR$	1pt	1pt	
<b>c4)</b>	$\eta_{rel} = 0.5 * E(\varepsilon_{ult} - \varepsilon_{p;ult})^2$ $E \approx 95.32$ GPa	1pt 1pt	2pts	page2
<b>c5)</b>	$\sigma_{ult} \rightarrow$ hauteur triangle $PQR$ $\sigma_{ult} = E(\varepsilon_{ult} - \varepsilon_{p;ult}) \approx 1537$ MPa	1pt 1pt	2pts	
<b>d1)</b>	$\eta_e = 0.5 * \sigma_e^2 / E$ $\sigma_e \approx 873$ MPa	1pt 1pt	2pts	
<b>d2)</b>	$\varepsilon_e = \sigma_e / E \approx 0.00916$ $l_e = l_0 e^{\varepsilon_e} \approx 100.92$ mm	1pt 1pt	2pts	page3
<b>d3)</b>	incompressible $\rightarrow \nu = 0.5$ $R_e = \sigma_e e^{-\varepsilon_e} \approx 865$ Mpa	1pt 1pt	2pts	
<b>e1)</b>	$\sigma_{ult} = K \varepsilon_{ult}^n$ et $\sigma_e = K \varepsilon_e^n$ $\frac{\sigma_{ult}}{\sigma_e} = \left( \frac{\varepsilon_{ult}}{\varepsilon_e} \right)^n$	1pt 1pt	2pts	
<b>e2)</b>	$\ln \frac{\sigma_{ult}}{\sigma_e} = n \ln \frac{\varepsilon_{ult}}{\varepsilon_e}$ $n = 0.184$ MPa	1pt 1pt	2pts	
<b>e3i)</b>	$K = E \varepsilon_e^{1-n} = 2'070$ MPa	1pt	1pt	page 4
<b>e3ii)</b>	$R_m = K \left( \frac{n}{e} \right)^n \approx 1'261$ MPa	1pt	1pt	
<b>e3iii)</b>	$R_{ult} = R_m \left( \frac{\varepsilon_{ult}}{n} e^{1 - \frac{\varepsilon_{ult}}{n}} \right)^n \approx 1'236$ MPa	1pt	1pt	
<b>f1)</b>	Localisation de $F_{max}/S_0$ par rapp. à $R_e$ et $R_m$ Calcul de $\alpha \approx 0.104313$ Application de l'algorithme Conclusion	1pt 1pt 1pt 1pt	4pts	page 6
<b>f2)</b>	équation de la déf. permanente $\varepsilon_{p;max} \approx 0.117$	1pt 1pt	2pts	
<b>f3)</b>	additivité des taux réels $L_f \approx 3'221$ mm	2pts 1pt	3pts	
<b>Total</b>		<b>32pts</b>		