For translation

$$\hat{r}_L = k_{EX} R_T \left(\frac{mRNA^*}{\tau_T K_T + (\tau_T + 1) mRNA^*}\right)$$

$$k_{EX} = K_p \left(\frac{\dot{v}_T}{L_P}\right)$$

$$= \left(\frac{16.5\ aa/s \times 3600\ s/h}{308\ aa}\right) = 192.86\ h^{-1}$$

$$mRNA^* = \frac{\dot{v}_x}{\lambda} = \frac{5.88\ \mu M/s \times 3600\ s/h}{8.35/h} = 2535.1\ \mu M$$

$$0 \le v_5 \le \hat{r}_L = 192.86\ h^{-1} \cdot 1.6\mu M \left(\frac{2535.1\mu M}{0.8 \times 57\mu M + (0.8+1)\,2535.1\mu M}\right)$$

$$= 169.7\ \mu M/h$$

$$= 0.047\ \mu M/s$$

c). In linear programming problems, the shadowprice of a constraint is the difference between the optimised value of the objective function and the value of object function, evaluated at the optional basis, when the right hand side of a constraint is increased by a unit. In our problem, we can observe that by increasing the metabolite by one unit, the flux b shows how much more protein can be produced