

Process Systems Engineering

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- Tutorial 0 -

Using a spreadsheet to perform simplified calculations

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Exercise 1

Compare an investment of € 10,000 that after seven years produces a gross interest of 34%, less taxes of 12.5% (on the profits obtained), with respect to depositing in the bank the same amount for the same period, with a rate of gross annual interest of 4.6% and 27.5% taxes on profits.



Exercise 1

Initial Capital: 10,000 €

Solution A

Time: 7 years
Interest:
34% (in 7 years)
Taxes on profits: 12.5%

Solution B

Time: 7 years
Interest per years:
4.6%
Taxes on profits: 27.5%

Choose solution A or B?



Exercise 2

Compare the cost of a telephone call made through operators A or B

A) $5.68E-4$ € / s with VAT from 00.00 to 24.00

B) € 0052 to answer plus VAT and €/min 0,014 plus VAT from 8 AM to 6:30 PM and 0.0077 €/min plus VAT from 6:30 PM to 8 AM.



Exercise 2

Rate A

Connection Fees :

€ 0.00

Cost:

$5.68E-4$ €/s

Rate B

Connection Fees :

€ 0.052

Cost:

$1.4E-2$ €/min + VAT

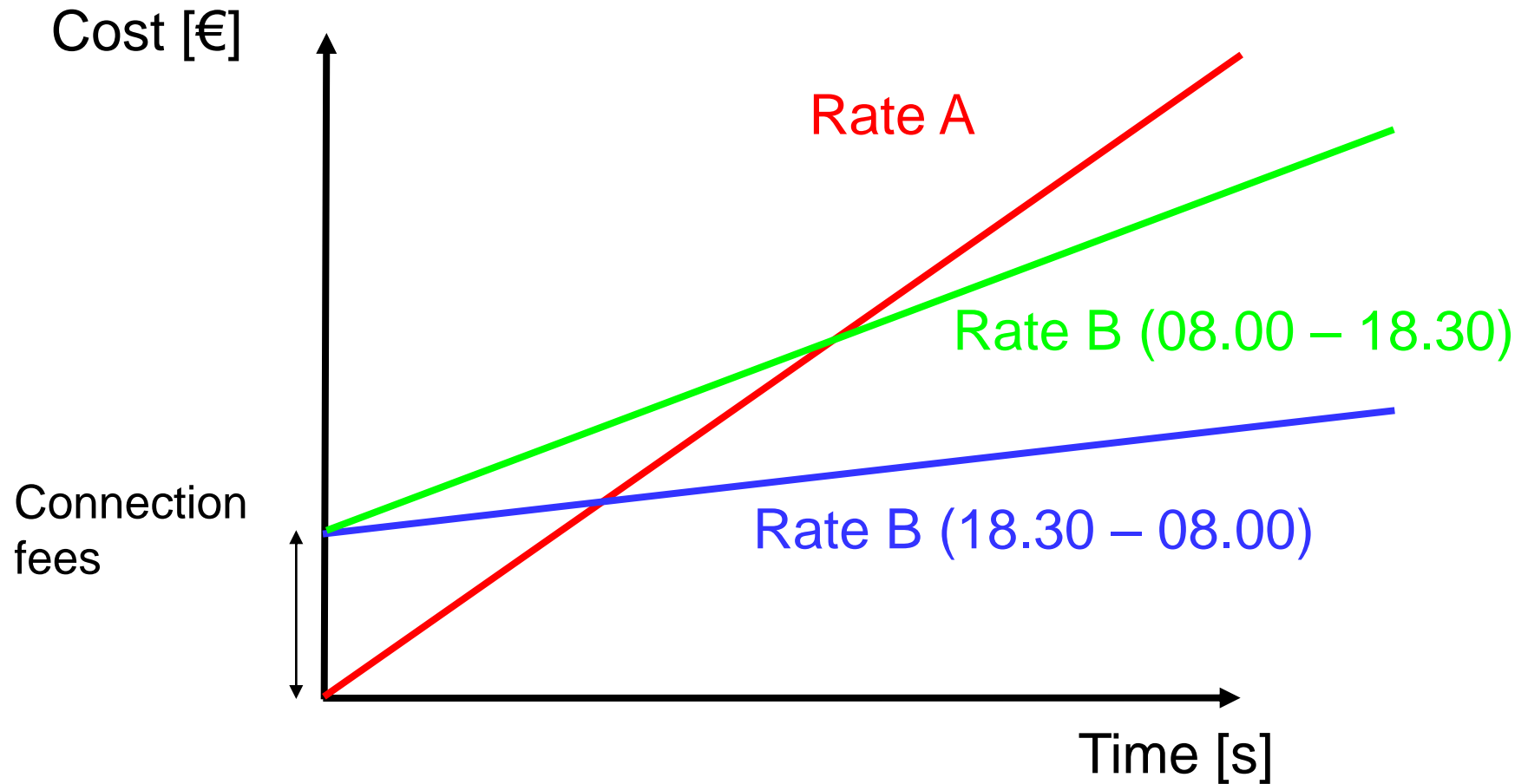
(from 8 AM to 6:30 PM)

$7.7E-3$ €/min + VAT

(from 6:30 PM to 8 AM)



Exercise 2



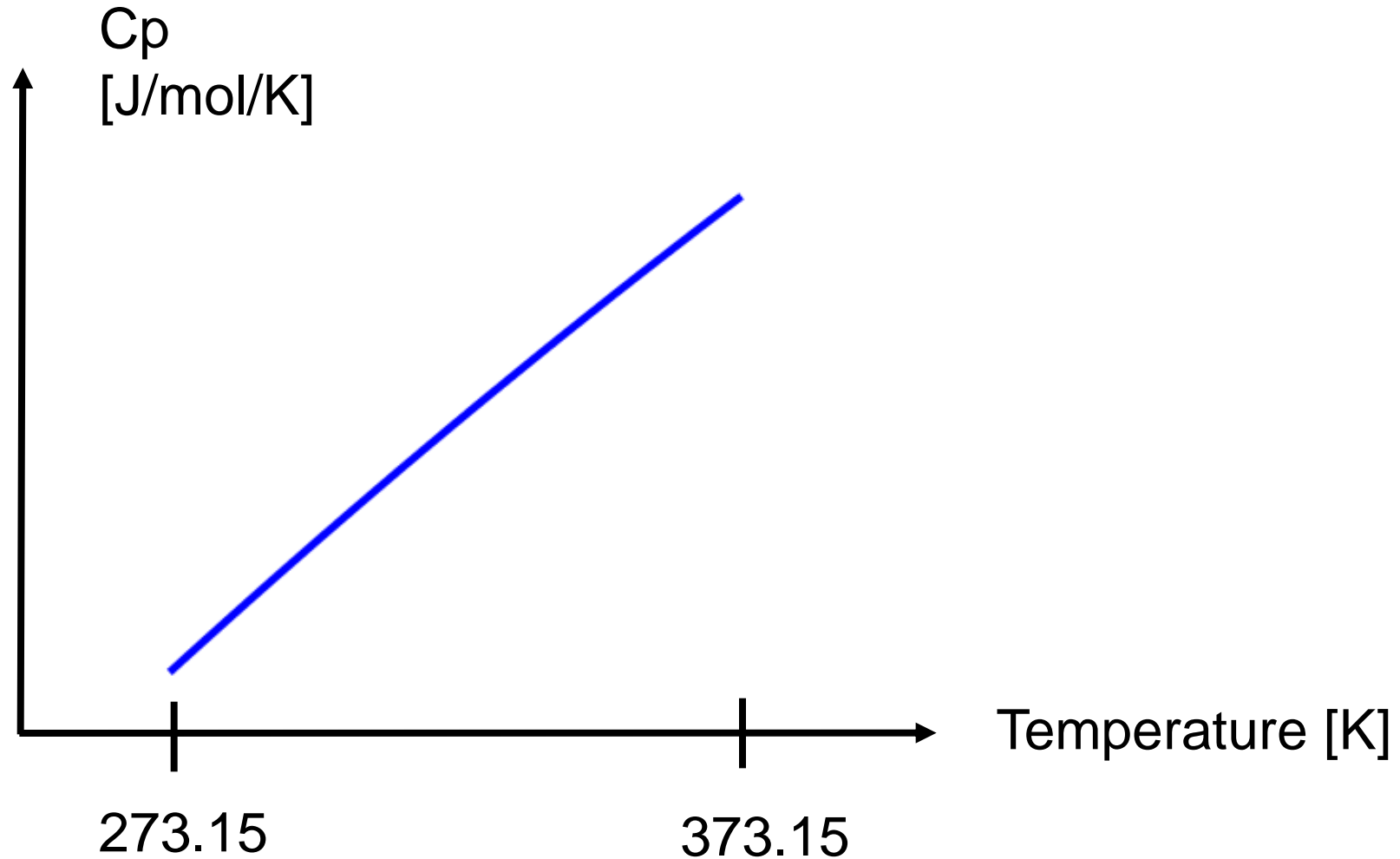
Exercise 3

For SO_2 , determine the trend of the specific heat at constant pressure in the gas phase and of the vapor pressure within the range 0, ... 100 °C

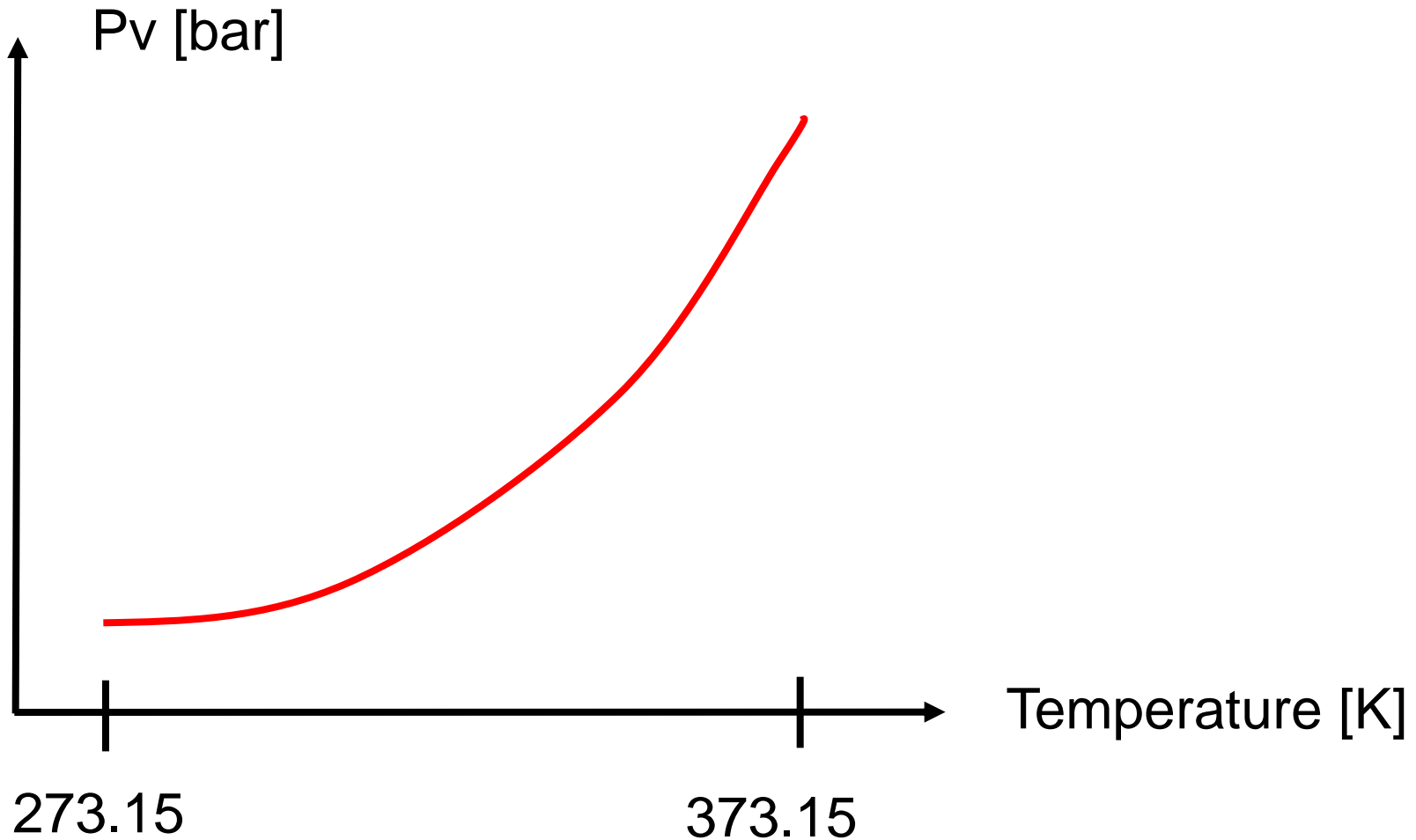
- $C_p = A + B \cdot T + C \cdot T^2 + D \cdot T^3$ [J/mol/K] where T is in K
A = 2.385E1 B = 6.699E-2 C = -4.961E-5
D = 1.328E-8
- $\ln(P_v) = A - B/T + C \cdot \ln(T) + D \cdot P_v/T^2$ [bar]
where T is in K
A = 48.882 B = 4552.50 C = -5.666 D = 990.



Exercise 3



Exercise 3



Exercise4

For SO₂, compare the trends of the specific heat in the gas-phase by using formulas 1 and 2.

- $Cp_1 = A + B \cdot T + C \cdot T^2 + D \cdot T^3$ [J/mol/K] where T is in K

$$A = 2.385E1 \quad B = 6.699E-2 \quad C = -4.961E-5 \quad D = 1.328E-8$$

- $Cp_2 = A + B \cdot (C/T / \text{SINH}(C/T))^2 + D \cdot (E/T / \text{COSH}(E/T))^2$ [J/kmol/K] where T is in K

$$A = 3.3375E+04 \quad B = 2.5864E+04 \quad C = 9.3280E+02$$
$$D = 1.0880E+04 \quad E = 4.2370E+02$$



Exercise4

