analysis

May 13, 2023

1 Modules

[ ]:
```python
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
```

2 Data

[ ]:
```python
burette = pd.read_csv( "burette.txt" )
pycnometer = pd.read_csv( "pycnometer.txt" )
volumetric_pipette = pd.read_csv( "volumetric-pipette.txt")

#volumetric pipette and pycnometer

m = 10.4 #g

#info
rho = 0.9986 #g/mnol
T = 18.1 #°C
```

[ ]:
```python
burette
```

[ ]:

	V(mL)	m(g)
0	5.0	5.02
1	10.0	9.96
2	15.0	14.92
3	20.0	19.95
4	25.0	24.94

[ ]:
```python
pycnometer
```

[ ]:

	m-pycnometer(g)	m-pycnometer-water(g)	m-pycnometer-NaCl(g)
0	7.56	12.89	13.36
1	7.48	12.90	13.32
2	7.61	12.84	13.39
3	7.55	12.82	13.37
4	7.59	12.86	13.31

[ ]:
```
volumetric_pipette
```

[ ]:

	m_water(g)
0	10.04
1	10.07
2	10.06
3	10.05
4	10.02

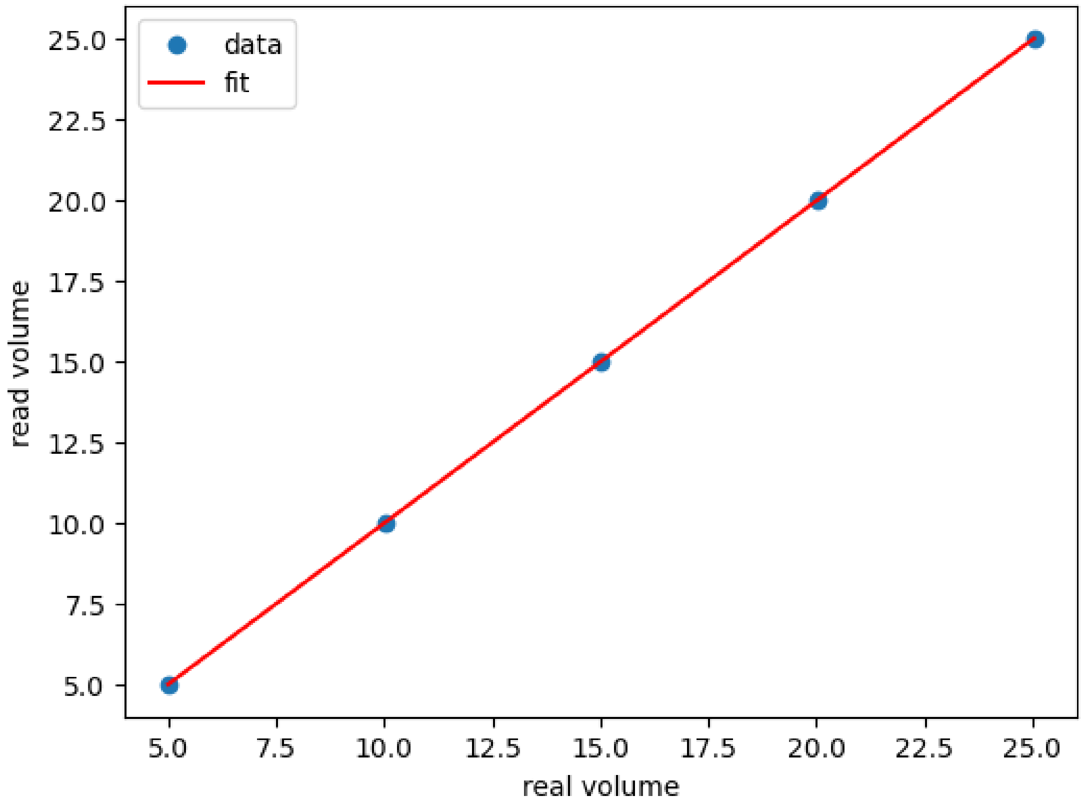
3 Burette

[ ]:
```
real_V = burette["V(mL)"]/rho
fig,ax = plt.subplots()
ax.scatter(   real_V , burette["V(mL)"] , label="data")
ax.set_xlabel("real volume" )
ax.set_ylabel("read volume" )

coeff , cov = np.polyfit(  real_V, burette["V(mL)"] , 1 , cov= True)
fit = np.poly1d(coeff)

ax.plot( real_V, fit(real_V), label="fit",color="red")

plt.legend()
plt.show()
```



[ ]:
```
m = round(  coeff[0] , 3 )
deltam = round( coeff[1] , 16 )
"El ajuste es Vread = ("+str(m)+" +- "+ str(deltam) +")mL^-1 Vreal (b is␣
↪approximately 0)"
```

[ ]: 'El ajuste es Vread = (0.999 +- 4e-16)mL^-1 Vreal (b is approximately 0)'

4 Volumetric pipette

[ ]:
```
v_water = volumetric_pipette["m_water(g)"]/rho
mean_v_water = v_water.mean().round(2)
std_v_water = round( v_water.std() , 2 )
"The volume of the volumetric pipette is ("+ str( mean_v_water )+" +-␣
↪"+str(std_v_water )+" )mL"
```

[ ]: 'The volume of the volumetric pipette is (10.06 +- 0.02)mL'

[ ]:
```
error = round( abs( (mean_v_water - 10)/10  )*100 , 1)
"The percentage error of the pipette volume (theoretical volume of 10mL) is␣
↪"+str(error)+"%"
```

[ ]: 'The percentage error of the pipette volume (theoretical volume of 10mL) is 0.6%'

5 Pycnometer

```
[ ]: v_pycnometer = round( ( pycnometer["m-pycnometer-water(g)"] -␣
      ↪pycnometer["m-pycnometer(g)"] ).mean() / rho , 2 )
     std_v_pycnometer = round( ( pycnometer["m-pycnometer-water(g)"] -␣
      ↪pycnometer["m-pycnometer(g)"] ).std() / rho , 2 )

     "The volume of the pycnometer is ("+ str(v_pycnometer) +" +-␣
      ↪"+str(std_v_pycnometer)+ ") mL"
```

[ ]: 'The volume of the pycnometer is (5.31 +- 0.07) mL'

6 Density of solution of $NaCl$

```
[ ]: rho_NaCl = round( pycnometer["m-pycnometer-NaCl(g)"].mean() / v_pycnometer , 2)
     std_rho_NaCl = round(  pycnometer["m-pycnometer-NaCl(g)"].std() / v_pycnometer␣
      ↪, 2  )
     "The density of the solution of NaCl is ("+ str(rho_NaCl)␣
      ↪+"+-"+str(std_rho_NaCl)+ ") g/mL"
```

[ ]: 'The density of the solution of NaCl is (2.51+-0.01) g/mL'