Scilab Textbook Companion for Engineering Chemistry by P. N. Dave and S. G. Pillai[1]

Created by
Vishwa Shah
Instrumentation and Control
Instrumentation Engineering
Institute of Technology, Nirma University
College Teacher
None
Cross-Checked by
Lavitha Pereira

July 31, 2019

[1]Funded by a grant from the National Mission on Education through ICT, http://spoken-tutorial.org/NMEICT-Intro. This Textbook Companion and Scilab codes written in it can be downloaded from the "Textbook Companion Project" section at the website http://scilab.in

Book Description

Title: Engineering Chemistry

Author: P. N. Dave and S. G. Pillai

Publisher: Mahajan Publishing, Ahmedabad

Edition: 1

Year: 2011

ISBN: 978-93-81256-28-2

Scilab numbering policy used in this document and the relation to the above book.

Exa Example (Solved example)

Eqn Equation (Particular equation of the above book)

AP Appendix to Example(Scilab Code that is an Appednix to a particular Example of the above book)

For example, Exa 3.51 means solved example 3.51 of this book. Sec 2.3 means a scilab code whose theory is explained in Section 2.3 of the book.

Contents

List of Scilab Codes

Chapter 1

Water

Scilab code Exa 1.1 Calculating Hardness

```
1 //calculating hardness
2 //Example 1.1
3 clc
4 clear
5 //100gm of CaCO3 = 136gm of CaSO4
6 m=204//mass of the substance
7 wt=136//molecular mass
8 Eq=(m*100)/wt//Equivalents of CaCO3
9 printf('Thus Equivalents of CaCO3 = %3.2f mg/L or
    ppm',Eq)
```

Scilab code Exa 1.2 Calculating Mass

```
1 //calculating mass
2 //Example 1.2
3 clc
4 clear
5 wt=152//molar mass of FeSo4 in moles
```

```
Eq=210.5//equivalents of CaCO3 in ppm
m=wt*Eq/100//Mass of FeSO4 in ppm
m1=m/1000//Mass of FeSO4 required per liter
printf('Thus the mass of FeSO4 required per litre is
    %2.5f g/L',m1)
```

Scilab code Exa 1.3 Calculating Hardness

```
//calculating hardness
//Example 1.3
clc
clear
//For Ca(HCO3)2,
q1=10//quantity
wt1=162//molecular weight
M1=100/wt1//multiplication factor
Eq1=M1*q1//CaCO3 equivalents in mg/L
//For Mg(HCO3)2,
q2=8.5//quantity
wt2=146//molecular weight
M2=100/wt2//multiplication factor
Eq2=M2*q2//CaCO3 equivalents in mg/L
//For CaSO4,
q3=12//quantity
wt3=136//molecular weight
M3=100/wt3//multiplication factor
Eq3=M3*q3//CaCO3 equivalents in mg/L
//For MgSO4,
q4=14//quantity
wt4=120//molecular weight
M4=100/wt4//multiplication factor
Eq4=M4*q4//CaCO3 equivalents in mg/L
Th=Eq1+Eq2//Temperory hardness due to Mg(HCO3)2 and
   Ca(HCO3)2
Ph=Eq3+Eq4//Permanent hardness due to CaSO4 and
```

```
    MgSO4
27 T=Th+Ph//Total hardness
28 printf('Thus (i) in mg/L Temporary hardness = %2.2f'
    ,Th)
29 printf('\n and permanent hardness = %2.2f',Ph)
30 printf('\n and total hardness = %2.2f',T)
31 printf('\n\n(ii) in ppm Temporary hardness = %2.2f',
    Th)
32 printf('\n and permanent hardness = %2.2f',Ph)
33 printf('\n and total hardness = %2.2f',T)
34 ThC=Th*0.07//temperory hardness in degreeCl
35 PhC=Ph*0.07//permanent hardness in degreeCl
36 TC=T*0.07//total hardness in degreeCl
37 ThF=Th*0.1//temperory hardness in degreeFr
38 PhF=Ph*0.1//permanent hardness in degreeFr
39 TF=T*0.1//total hardness in degreeFr
40 printf('\n\n(iii) in degreeCl Temporary hardness =
    %2.4f',ThC)
41 printf('\n and permanent hardness = %2.4f',PhC)
42 printf('\n and total hardness = %2.4f',TC)
43 printf('\n\n(iv) in degreeFr Temporary hardness = %2
    .4f',ThF)
44 printf('\n and permanent hardness = %2.4f',PhF)
45 printf('\n and total hardness = %2.4f',TF)
```

Scilab code Exa 1.4 Calculating Hardness

```
1 //calculating hardness
2 //Example 1.4
3 clc
4 clear
5 //For Ca(HCO3)2,
6 q1=40.5//quantity
7 wt1=162//molecular weight
8 M1=100/wt1//multiplication factor
```

```
Eq1=M1*q1//CaCO3 equivalents in mg/L
//For Mg(HCO3)2,
q2=46.5//quantity
wt2=146//molecular weight
M2=100/wt2//multiplication factor
Eq2=M2*q2//CaCO3 equivalents in mg/L
//For MgSO4,
q3=27.6//quantity
wt3=120//molecular weight
M3=100/wt3//multiplication factor
Eq3=M3*q3//CaCO3 equivalents in mg/L
//For CaSO4,
q4=32.1//quantity
wt4=136//molecular weight
M4=100/wt4//multiplication factor
Eq4=M4*q4//CaCO3 equivalents in mg/L
//For CaCl2
q5=22.45//quantity
wt5=111//molecular weight
M5=100/wt5//multiplication factor
Eq5=M5*q5//CaCO3 equivalents in mg/L
Th=Eq1+Eq2//Temperory hardness due to Mg(HCO3)2 and
   Ca(HCO3)2
Ph=Eq3+Eq4+Eq5//Permanent hardness due to CaSO4 and
   MgSO4 and CaCl2
T=Th+Ph//Total hardness
printf('Thus in Temporary hardness = %2.2f mg/L',Th)
printf('\n and permanent hardness = %2.2f mg/L',Ph)
printf('\n and total hardness = %3.2f mg/L',T)
```

Scilab code Exa 1.5 Calculating Hardness

```
//calculating hardness
//Example 1.5
clc
```

```
clear
//For Ca(HCO3)2,
q1=12.5//quantity
wt1=162//molecular weight
M1=100/wt1//multiplication factor
Eq1=M1*q1//CaCO3 equivalents in mg/L
//For CaCl2,
q2=8.2//quantity
wt2=111//molecular weight
M2=100/wt2//multiplication factor
Eq2=M2*q2//CaCO3 equivalents in mg/L
//For MgSO4,
q3=2.6//quantity
wt3=120//molecular weight
M3=100/wt3//multiplication factor
Eq3=M3*q3//CaCO3 equivalents in mg/L
Th=Eq1//Temperory hardness due to Ca(HCO3)2 in ppm
Ph=Eq3+Eq2//Permanent hardness due to MgSO4 and
   CaCl2 in ppm
T=Th+Ph//Total hardness in ppm
TF=T*0.1//Total hardness in degreeFr
printf('Thus in ppm Temporary hardness = %2.2f ppm',
   Th)
printf('\n and permanent hardness = %2.2f ppm',Ph)
printf('\n in degreeFr total hardness = %3.3f',TF)
```

Scilab code Exa 1.6 Calculating Lime and Soda

```
//calculating lime and soda
//Example 1.6
clc
clear
//For Ca(HCO3)2,
q1=4.86//quantity
wt1=162//molecular weight
```

```
M1=100/wt1//multiplication factor
Eq1=M1*q1//CaCO3 equivalents in mg/L
//For Mg(HCO3)2,
q2=7.3//quantity
wt2=146//molecular weight
M2=100/wt2//multiplication factor
Eq2=M2*q2//CaCO3 equivalents in mg/L
//For CaSO4,
q3=6.8//quantity
wt3=136//molecular weight
M3=100/wt3//multiplication factor
Eq3=M3*q3//CaCO3 equivalents in mg/L
//For MgCl2,
q4=5.7//quantity
wt4=95//molecular weight
M4=100/wt4//multiplication factor
Eq4=M4*q4//CaCO3 equivalents in mg/L
//For MgSO4,
q5=9//quantity
wt5=120//molecular weight
M5=100/wt5//multiplication factor
Eq5=M5*q5//CaCO3 equivalents in mg/L
//SiO2 and NaCl neglected
V=25000//Volume of water in litres
L=74*(Eq1+(2*Eq2)+Eq4+Eq5)/100//lime requirement in
   mg/L
L1=L*V/1000000//Lime required for softening 25000
   litres in kg
S=106*(Eq3+Eq4+Eq5)/100//soda requirement in mg/L
S1=S*V/1000000//soda required for softening 25000
   litres in kg
printf('Thus amount of lime required to soften 25000
    litres of water = %2.5f kg\n',L1)
printf('and amount of soda required to soften 25000
   litres of water = %2.5f kg\n',S1)
```

Scilab code Exa 1.7 Calculating Hardness and Lime Soda

```
1  //calculating lime-soda and hardness
2  //Example 1.7
3  clc
4  clear
5  //For Ca(HCO3)2,
6  q1=40.5//quantity
7  wt1=162//molecular weight
8  M1=100/wt1//multiplication factor
9  Eq1=M1*q1//CaCO3 equivalents in mg/L
10 //For Mg(HCO3)2,
11 q2=36.5//quantity
12 wt2=146//molecular weight
13 M2=100/wt2//multiplication factor
14 Eq2=M2*q2//CaCO3 equivalents in mg/L
15 //For MgSO4,
16 q3=30//quantity
17 wt3=120//molecular weight
18 M3=100/wt3//multiplication factor
19 Eq3=M3*q3//CaCO3 equivalents in mg/L
20 //For CaSO4,
21 q4=34//quantity
22 wt4=136//molecular weight
23 M4=100/wt4//multiplication factor
24 Eq4=M4*q4//CaCO3 equivalents in mg/L
25 //For CaCl2,
26 q5=27.75//quantity
27 wt5=111//molecular weight
28 M5=100/wt5//multiplication factor
29 Eq5=M5*q5//CaCO3 equivalents in mg/L
30 // NaCl neglected
31 V=20000//Volume of water in litres
32 L=(74*(Eq1+(2*Eq2)+Eq3)/100)*(V/1000)//Lime required
```

```
    for softening 20000 litres in g
S=(106*(Eq3+Eq4+Eq5)/100)*(V/1000)//soda required
    for softening 20000 litres in g
L1=(100*L)/(84*1000)//Lime required for 84% purity
    in kg
S1=(100*S)/(92*1000)//Soda required for 92% purity
    in kg
Th=Eq1+Eq2//Temperory hardness due to Mg(HCO3)2 and
    Ca(HCO3)2
Ph=Eq3+Eq4+Eq5//Permanent hardness due to CaSO4 and
    MgSO4and CaCL2
printf('Thus amount of lime(84percent pure) required
    to soften 20000 litres of water = %2.5f kg\n',L1
    )
printf('and amount of soda(92percent pure) required
    to soften 20000 litres of water = %2.5f kg\n',S1)
printf('\nAlso Temporary hardness = %2.2f ppm',Th)
printf('\n and permanent hardness = %2.2f ppm',Ph)
```

Scilab code Exa 1.8 Calculating Lime and Soda

```
//calculating lime and soda
//Example 1.8
clc
clear
//For raw water Ca+2,
q1=240//quantity
wt1=40//molecular weight
M1=100/wt1//multiplication factor
Eq1=M1*q1//CaCO3 equivalents in mg/L
//For Mg+2,
q2=96//quantity
wt2=24//molecular weight
M2=100/wt2//multiplication factor
Eq2=M2*q2//CaCO3 equivalents in mg/L
```

```
15 //For CO2,
16 q3=44//quantity
17 wt3=44//molecular weight
18 M3=100/wt3//multiplication factor
19 Eq3=M3*q3//CaCO3 equivalents in mg/L
20 //For HCO3-,
21 q4=732//quantity
22 wt4=122//molecular weight
23 M4=100/wt4//multiplication factor
24 Eq4=M4*q4//CaCO3 equivalents in mg/L
25 //For FeSO4.7H2O,
26 q5=278//quantity
27 wt5=278//molecular weight
28 M5=100/wt5//multiplication factor
29 Eq5=M5*q5//CaCO3 equivalents in mg/L
30 V=250000//Volume of water in litres
31 L=(74*(Eq2+Eq3+Eq4+Eq5)/100)*(V/1000000)//lime
      requirement in kg
32 S=(106*(Eq1+Eq2+Eq5-Eq4)/100)*(V/1000000)//soda
      requirement in kg
33 printf('Thus amount of lime required to soften
      250000 litres of water = %3.1f kg\n',L)
34 printf('and amount of soda required to soften 250000
       litres of water = %3.1f kg\n',S)
```

Scilab code Exa 1.9 Calculating Lime and Soda

```
1 //calculating lime and soda
2 //Example 1.9
3 clc
4 clear
5 //For raw water Ca+2,
6 q1=160//quantity
7 wt1=40//molecular weight
8 M1=100/wt1//multiplication factor
```

```
Eq1=M1*q1//CaCO3 equivalents in mg/L
//For Mg+2,
q2=96//quantity
wt2=24//molecular weight
M2=100/wt2//multiplication factor
Eq2=M2*q2//CaCO3 equivalents in mg/L
//For CO2,
q3=34//quantity
wt3=44//molecular weight
M3=100/wt3//multiplication factor
Eq3=M3*q3//CaCO3 equivalents in mg/L
//For HCO3-,
q4=403//quantity
wt4=122//molecular weight
M4=100/wt4//multiplication factor
Eq4=M4*q4//CaCO3 equivalents in mg/L
//For NaAlO2,
q5=20//quantity
wt5=82*2//molecular weight
M5=100/wt5//multiplication factor
Eq5=M5*q5//CaCO3 equivalents in mg/L
V=300000//Volume of water in litres
L=(74*(Eq2+Eq3+Eq4-Eq5)/100)*(V/1000000)//lime
   requirement in kg
S=(106*(Eq1+Eq2-Eq4)/100)*(V/1000000)//soda
   requirement in kg
printf('Thus amount of lime required to soften
   250000 litres of water = %3.1f kg\n',L)
printf('and amount of soda required to soften 250000
    litres of water = %3.1f kg\n',S)
```

Scilab code Exa 1.10 Calculating Volume

```
//calculating volume
//Example 1.10
```

```
clc
clear
v=100//Amount of NaCl solution in litres
m=120*v//Amount of NaCl in g
wt=58.5*2//molecular mass of NaCl
Eq=m*100/wt//Equivalents of CaCO3 in g
h=500//hardness in ppm
V=Eq*1000/h//water required to soften the zeolite softner in litres
printf('Thus the zeolite softner can soften %5.2f L of Hard water',V)
```

Scilab code Exa 1.11 Calculating Hardness

```
//calculating hardness
//Example 1.11
clc
clear
v=30//Amount of NaCl solution in litres
m=15*v//Amount of NaCl in g
wt=58.5*2//molecular mass of NaCl
Eq=m*100/wt//Equivalents of CaCO3 in g
V=1000//water required to soften the zeolite softner in litres
h=Eq*1000/V//hardness in ppm
printf('Thus the hardness of water = %3.2f ppm',h)
```

Chapter 2

Fuel

Scilab code Exa 2.1 Calculating GCV and NCV

```
1 //calculating GCV and NCV
2 //Example 2.1
3 clc
4 clear
5 C=60//percentage of Carbon in coal
6 O=33//percentage of Oxygen in coal
7 H=6//percentage of Hydrogen in coal
8 S=0.5//percentage of Sulphur in coal
9 N=0.5//percentage of Nitrogen in coal
10 GCV=((8080*C)+(34500*(H-O/8))+(2240*S))/100//gross
    calorific value in kcal/kg
11 NCV=(GCV-(0.09*H*587))//net calorific value in kcal/
    kg
12 printf('Thus the higher calorific value of coal = %4
    .2f kcal/kg',GCV)
13 printf('\n and the lower calorific value of coal =
    %4.2f kcal/kg',NCV)
```

Scilab code Exa 2.2 Calculating GCV and NCV

```
1 //calculating GCV and NCV
2 //Example 2.2
3 clc
4 clear
5 C=90//percentage of Carbon in coal
6 O=2//percentage of Oxygen in coal
7 H=4//percentage of Hydrogen in coal
8 S=2.5//percentage of Sulphur in coal
9 N=1//percentage of Nitrogen in coal
10 GCV=((8080*C)+(34500*(H-O/8))+(2240*S))/100//gross
    calorific value in kcal/kg
11 NCV=(GCV-(0.09*H*587))//net calorific value in kcal/
    kg
12 printf('Thus the gross calorific value of coal = %4
    .2f kcal/kg',GCV)
13 printf('\n and the net calorific value of coal = %4
    .2f kcal/kg',NCV)
```

Scilab code Exa 2.3 Calculating GCV and NCV

```
1 //calculating GCV and NCV
2 //Example 2.3
3 clc
4 clear
5 C=80//percentage of Carbon in coal
6 O=3//percentage of Oxygen in coal
7 H=7//percentage of Hydrogen in coal
8 S=3.5//percentage of Sulphur in coal
9 N=2.1//percentage of Nitrogen in coal
10 GCV=((8080*C)+(34500*(H-O/8))+(2240*S))/100//gross
    calorific value in kcal/kg
11 NCV=(GCV-(0.09*H*587))//net calorific value in kcal/
    kg
12 printf('Thus the gross calorific value of coal = %4
    .0f kcal/kg',GCV)
```

```
13 printf('\n and the net calorific value of coal = %4
   .0f kcal/kg',NCV)
```

Scilab code Exa 2.4 Calculating GCV and NCV

```
1 //calculating GCV and NCV
2 //Example 2.4
3 clc
4 clear
5 C=84//percentage of Carbon in coal
6 O=8.4//percentage of Oxygen in coal
7 H=5.5//percentage of Hydrogen in coal
8 S=1.5//percentage of Sulphur in coal
9 N=0.6//percentage of Nitrogen in coal
10 GCV=((8080*C)+(34500*(H-O/8))+(2240*S))/100//gross
   calorific value in kcal/kg
11 NCV=(GCV-(0.09*H*587))//net calorific value in kcal/
   kg
12 printf('Thus the gross calorific value of coal = %4
   .0f kcal/kg',GCV)
13 printf('\n and the net calorific value of coal = %4
   .0f kcal/kg',NCV)
```

Scilab code Exa 2.5 Proximate Analysis

```
1 //calculating proximate analysis
2 //Example 2.5
3 clc
4 clear
5 m1=1//mass of air dried coal in g
6 m2=0.985//mass of dry coal residue after heating for
    1hr in g
7 m3=0.8//mass of residue after heating for 7min in g
```

```
m4=0.1//mass of last residue
Mm=m1-m2//mass of moisture in coal sample in g
Mv=m2-m3//mass of volatile matter in g
Ma=m4//mass of ash
%m=Mm*100//percentage moisture
%v=Mv*100//percentage of volatile matter
%a=Ma*100//percentage of ash
%c=100-(%m+%v+%a)//percentage of fixed carbon
printf('Thus (i)percentage of moisture = %2.1f
    percent\n',%m)
printf('(ii)percentage of volatile matter = %2.1f
    percent\n',%v)
printf('(iii)percentage of ash = %2.0f percent\n',%a
    )
printf('(iv)percentage of fixed carbon = %2.0f
    percent \n',%c)
```

Scilab code Exa 2.6 Calculating percentage C and H

```
//calculating percentage C and H
//Example 2.6
clc
clear
wt1=2.75//increase in wt of KOH tube in gm
wt2=0.45//increase in wt of CaCl2 tube in gm
wt=1//weight of coal sample in gm
%c=(wt1*12*100)/(wt*44)//percentage of carbon
%h=(wt2*2*100)/(wt*18)//percentage of hydrogen
printf('Thus (i)Percentage of carbon = %2.0f percent
    ',%c)
printf('\n(ii)Percentage of hydrogen =%2.0f percent'
    ,%h)
```

Scilab code Exa 2.7 Calculating percentage S and N

```
1 //calculating percentage S and N
2 //Example 2.7
3 clc
4 clear
5 wt1=2.6//weight of coal taken for quantitative
     analysis in gm
6 wt=1.56//weight of coal sample taken in gm
7 v=50-6.25//volume of H2SO4 used
8 N=0.1//normality
9 m=0.1755//wt of BaSO4 ppt. obtained
10 %n=(v*N*1.4)/(wt)//percentage of nitrogen
11 %su=(m*32*100)/(wt1*233)//percentage of sulphur
12 printf('Thus (i)Percentage of nitrogen = %2.3f
     percent',%n)
13 printf('\n(ii)Percentage of sulphur =%2.3f percent',
     %su)
```

Scilab code Exa 2.8 Calculating percentage S

```
1 //calculating percentage S
2 //Example 2.8
3 clc
4 clear
5 wt=0.5//weight of coal taken for quantitative
     analysis in gm
6 m=0.05//wt of BaSO4 ppt. obtained
7 %su=(m*32*100)/(wt*233)//percentage of sulphur
8 printf('Thus Percentage of sulphur =%2.3f percent',
     %su)
```

Chapter 5

Lubricants and Greases

Scilab code Exa 5.1 Calculating VI

```
1 //calculating VI
2 //Example 5.1
3 clc
4 clear
5 L=674//viscosity of low viscosity index oil
6 H=314//viscosity of high viscosity index oil
7 U=464//viscosity of test oil in S
8 VI=(L-U)*100/(L-H)//viscosity index
9 printf('Thus VI of the oil sample under test =%2.2f'
    ,VI)
```

Chapter 6

Electrochemical System

Scilab code Exa 6.1 Calculating emf

```
1 //calculating emf
2 //Example 6.1
3 clc
4 clear
5 Es=1.5273//emf of known cell in V
6 Ns=90//null point of known cell in cm
7 Nu=60//null point of unknown cell in cm
8 Eu=Nu*Es/Ns//Emf of cell
9 printf('Thus the emf of cell = %2.4f V',Eu)
```

Scilab code Exa 6.2 Calculating pH

```
1 //calculating pH
2 //Example 6.2
3 clc
4 clear
5 //for quinhydrone electrode
6 Ecell=0.284//Emf of cell in V
```

```
pH=(0.6996-0.2422-Ecell)/0.0591//pH of the solution
printf('Thus the pH of the solution = %2.3f V',pH)
```

Scilab code Exa 6.3 Calculating pH

```
//calculating pH
//Example 6.3
clc
clear
//for hydrogen electrode
Ecell=0.6734//Emf of cell in V
pH=(Ecell-0.2422)/0.0591//pH of the solution
printf('Thus the pH of the solution = %2.3f ',pH)
```

Scilab code Exa 6.4 Calculating potential

```
//calculating potential
//Example 6.4
clc
clear
Ag=1
Ksp=8.7*(10^-17)
Agplus=sqrt(Ksp)
X=Ag/Agplus
E1=0.799//E(Ag+/Ag)
E2=E1-(0.0591*log10(X))
printf('Thus E(Ag+/Ag) = %2.3f V',E2)
```

Scilab code Exa 6.5 Calculating solubility

```
1 //calculating solubility
2 //Example 6.5
3 clc
4 clear
5 Ecell=0.169
6 AgC=0.01
7 C1=AgC/(10^(Ecell/0.0591))
8 S=C1*143.5//solubility of AgCl in g/L
9 Ksp=C1^2//solubility product of AgCl in Mol^2/L^2
10 printf('Thus solubility of AgCl = %e g/L',S)
11 printf('\n and Ksp = %e Mol^2/L^2',Ksp)
```

Scilab code Exa 6.6 Calculating Ksp

```
1 //calculating Ksp
2 //Example 6.6
3 clc
4 clear
5 Ec=0.071
6 Ea=0.799
7 Ecell=Ec-Ea
8 Ksp=10^(Ecell/0.0591)//solubility product of AgCl in
    Mol^2/L^2
9 printf('Thus Ksp = %e Mol^2/L^2',Ksp)
```

Scilab code Exa 6.7 Calculating Kc

```
1 //calculating Kc
2 //Example 6.7
3 clc
4 clear
5 //E'cell=0.0591*logKc/n
6 Eag=0.8
```

```
7 Ecu=0.34
8 Ecell=Eag-Ecu
9 n=2
10 Kc=10^(n*Ecell/0.059)//equilibrium constant
11 printf('Thus the equilibrium constant for the
     reaction = %e',Kc)
```

Scilab code Exa 6.8 Calculating Kc

```
1 //calculating Kc
2 //Example 6.8
3 clc
4 clear
5 //E'cell=0.0591*logKc/n
6 Ecell=0.16
7 n=4
8 Kc=10^(n*Ecell/0.0591)//equilibrium constant
9 printf('Thus the equilibrium constant for the
     reaction = %e',Kc)
```

Scilab code Exa 6.9 Calculating deltaG and Kc

```
1 //calculating deltaG and Kc
2 //Example 6.9
3 clc
4 clear
5 Ecell=0.89//in V
6 n=6
7 F=96500// in 1/mol
8 deltaG=-n*F*Ecell//in C.V or J
9 //Kc related to deltaG
10 R=8.314//in J/molk
11 T=298//in K
```

```
12 Kc1=10^(-deltaG/(2.303*R*T))
13 //Kc related to Ecell
14 Kc2=10^((n*F*Ecell)/(2.303*R*T))
15 printf('Thus (i)deltaG = %e',deltaG)
16 printf('\n(ii)Kc in relation with deltaG = %e',Kc1)
17 printf('\n(iii)Kc in relation with Ecell = %e',Kc2)
```

Scilab code Exa 6.10 Calculating Kc

```
1 //calculating Kc
2 //Example 6.10
3 clc
4 clear
5 //E'cell=0.0591*logKc/n
6 Ecell=-0.8277
7 n=1
8 Kc=10^(n*Ecell/0.0591)//equilibrium constant
9 printf('Thus the equilibrium constant for the
    reaction = %e',Kc)
```

Scilab code Exa 6.11 Calculating Ecell and Energy

```
1 //calculating Ecell and energy
2 //Example 6.11
3 clc
4 clear
5 Ec=0.4
6 Ea=-0.87
7 Ecell=Ec-Ea
8 F=96500
9 Wmax=(2*F*Ecell)/1000
10 printf('Thus (i)Ecell = %2.2f V',Ecell)
11 printf('\n (ii)Wmax= %3.0f kJ',Wmax)
```

Scilab code Exa 6.12 Calculating Kc

```
1 //calculating Kc
2 //Example 6.12
3 clc
4 clear
5 //E'cell=0.0591*logKc/n
6 Ec=0.77
7 Ea=0.54
8 Ecell=Ec-Ea
9 n=2
10 Kc=10^(n*Ecell/0.059)//equilibrium constant
11 printf('Thus the equilibrium constant for the
   reaction = %e',Kc)
```