Scilab Textbook Companion for The Elements of Physical Chemistry by S. Glasstone[1]

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June 4, 2016

[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: The Elements of Physical Chemistry

Author: S. Glasstone

Publisher: Nostrand Company, New Delhi

Edition: 2

Year: 1946

ISBN: 978-0716735397

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

Atomic Theory

Scilab code Exa 1.1 ex 1

```
clc
//Intitalisation of variables
clear
dco= 1.9635 //gms/lit
do= 1.4277 //gms/lit
mo= 32 //gms
//CALCULATIONS
mwt= dco*mo/do
//RESULTS
printf ('Molecular weight of carbon dioxide = %.3f '
   ,mwt)
```

Scilab code Exa 1.2 ex 2

```
clc
//Intitalisation of variables
clear
shl= 0.031 //cal deg^-1 g^-1
```

```
5 ewlc= 103.605 //gms
6 n= 2
7 //CALCULATIONS
8 aw= n*ewlc
9 //RESULTS
10 printf ('Atomic weight of lead = %.2f gms',aw)
```

Scilab code Exa 1.3 ex 3

```
1 clc
2 //Intitalisation of variables
3 clear
4 ewt= 17.337 //gms
5 n=3
6 //CALCULATIONS
7 aw= ewt*n
8 //RESULTS
9 printf ('Atomic weight of chromium = %.2f gms',aw)
```

Chapter 4

Electronic structures of atoms and molecules

Scilab code Exa 4.1 ex 1

```
clc
//Intitalisation of variables
clear
v= 240 //ml
p= 1.25 //atm
p1= 0.75 //atm
n= 2
//CALCULATIONS
v1= v*p/p1
dv= v1-v
V= n*v1
//RESULTS
printf ('Increase in volume = %.f ml',dv)
printf ('\n Final volume = %.f ml',V)
```

Scilab code Exa 4.2 ex 2

```
clc
//Intitalisation of variables
clear
v1= 360 //ml
T1= 15 //C
v2= 480 //ml
//CALCULATIONS
T2= v2*(273+T1)/v1
Tc= T2-273
//RESULTS
printf ('Centigrade temperature = %.f C',Tc)
```

Scilab code Exa 4.3 ex 3

```
clc
//Intitalisation of variables
clear
p1= 1.4 //atm
v1= 250 //ml
t1= 21 //c
v2= 300 //ml
t2= 49 //c
//CALCULATIONS
p2= p1*v1*(273+t2)/(v2*(273+t1))
//RESULTS
printf ('Final pressure = %.2f atm',p2)
```

Scilab code Exa 4.4 ex 4

```
clc
//Intitalisation of variables
clear
v= 10 //lit
```

```
5 p= 75 //cm of hg
6 T= 27 //C
7 R= 0.082 //lit-atm/mole K
8 //CALCULATIONS
9 n= (p/76)*v/((273+T)*R)
10 //RESULTS
11 printf ('Moles of oxygen contained = %.3f moles',n)
```

Scilab code Exa 4.5 ex 5

```
1 clc
2 //Intitalisation of variables
3 clear
4 T= 25 //C
5 v= 190 //ml
6 pt= 740 //mm of hg
7 p1= 23.8 //mm of hg
8 p2= 760 //mm of hg
9 //CALCULATIONS
10 p= pt-p1
11 v= v*p/p2
12 //RESULTS
13 printf ('Partial pressure of dry gas = %.1f mm',p)
14 printf ('\n volume of the dry gas = %.f ml',v)
```

Scilab code Exa 4.6 ex 6

```
1 clc
2 //Intitalisation of variables
3 clear
4 ma= 0.495 //gm
5 Ma= 66 //gms
6 mb= 0.182 //gms
```

```
7 Mb= 45.5 //gms
8 p= 76.2 //cm of hg
9 //CALCULATIONS
10 na= ma/Ma
11 nb= mb/Mb
12 nt= na+nb
13 pa= p*na/nt
14 pb= p*nb/nt
15 //RESULTS
16 printf ('Number of moles of given gas A = %.4f ',na)
17 printf ('\n Number of moles of given gas B = %.4f ',
   nb)
18 printf ('\n Total number of moles  = %.4f ',nt)
19 printf ('\n Partial pressure of A  = %.1f cm of
   mercury',pa)
20 printf ('\n Partial pressure of B  = %.1f cm of
   mercury',pb)
```

Scilab code Exa 4.7 ex 7

```
1 clc
2 //Intitalisation of variables
3 clear
4 v1= 125 //ml
5 p1= 0.6 //atm
6 v2= 150 //ml
7 p2= 0.8 //atm
8 V= 500 //ml
9 //CALCULATIONS
10 pa= p1*v1/V
11 pb= p2*v2/V
12 pt= pa+pb
13 //RESULTS
14 printf ('Partial pressure of A = %.2f atm',pa)
15 printf ('\n Partial pressure of B = %.2f atm',pb)
```

```
16 printf ('\n Total pressure of A = %.2f atm',pt)
```

Scilab code Exa 4.8 ex 8

```
1  clc
2  //Intitalisation of variables
3  clear
4  t1= 1.44 //min
5  t2= 1.8 //min
6  mo= 32 //gms
7  mh= 2 //gms
8  //CALCULATIONS
9  d2= (t1/t2)^2*(mo/mh)
10 //RESULTS
11 printf ('Approximate density of gas relative to
     hydrogen = %.1f ',d2)
```

Scilab code Exa 4.9 ex 9

```
1  clc
2  //Intitalisation of variables
3  clear
4  T= 25 //C
5  R= 8.31*10^7 //ergs deg^-1 mole^-1
6  M= 32 //gms
7  //CALCULATIONS
8  c= sqrt(3*R*(273+T)/M)
9  //RESULTS
10 printf ('Mean velocity of oxygen molecules = %.2e cm
     sec^-1',c)
```

Scilab code Exa 4.10 ex 10

```
clc
//Intitalisation of variables
clear
n= 8.41*10^-5 //poise
p= 1 //atm
v= 22414 //ml
m= 2 //gms
T= 0 //C
R= 8.31*10^7 //ergs deg^-1 mole^-1
//CALCULATIONS
d= m/v
c= sqrt(8*R*(273+T)/(%pi*m))
l= 3*n/(d*c)
//RESULTS
printf ('Density of hydrogen gas = %.1e gram cc^-1',
   d)
printf ('\n Mean velocity = %.2e cm sec^-1',c)
printf ('\n Mean free path of the molecules = %.2e
   cm',l)
```

Scilab code Exa 4.11 ex 11

```
clc
//Intitalisation of variables
clear
t= 1 //sec
v= 1 //cc
T= 0 //C
p= 1 //atm
d= 8.9*10^-5 //g cc^-1
n= 8.41*10^-5 //poise
R= 8.31*10^7 //ergs deg^-1 mole^-1
M= 4 //gms
```

```
12 N= 6*10^23 //molecules
13 n1= 2 //moles
14 //CALCULATIONS
15 Z= M*(N/(v*22414))*d*R*(273+T)/(3*%pi*n1*n)
16 //RESULTS
17 printf ('Number of collisions = %.2e molecular
      collisions sec^-1 cc^-1',Z)
```

Scilab code Exa 4.12 ex 12

```
1 clc
2 //Intitalisation of variables
3 clear
4 d= 8.9*10^-5 //g cc^-1
5 R= 8.31*10^7 //ergs deg^-1 mole^-1
6 N= 2.7*10^19 //molecules
7 n= 8.41*10^-5 //poise
8 T= 0 //C
9 n1= 2 //moles
10 //CALCULATIONS
11 s= sqrt(n1*d*sqrt(R*(273+T)/(%pi*n1))/(3*%pi*n*N))
12 //RESULTS
13 printf ('Collision diamter of hydrogen = %.2e cm',s)
```

Scilab code Exa 4.13 ex 13

```
1 clc
2 //Intitalisation of variables
3 clear
4 n= 4
5 n1= 1
6 n2= 1.5
7 R= 2 //cal deg^-1 mole^-1
```

```
8 m=3
9 //CALCULATIONS
10 Cv= ((3*n-5)+n1+n2)*R
11 Cv1= ((3*n-6)+2*m*(n2-n1))*R
12 //RESULTS
13 printf ('Molar heat capacity of acetylene = %.f cal
     deg^-1 mole^-1',Cv)
14 printf ('\n Molar heat capacity of ammonia = %.f cal
     deg^-1 mole^-1',Cv1)
```

Scilab code Exa 4.14 ex 14

```
1 clc
2 //Intitalisation of variables
3 clear
4 v= 1.32 //lit
5 T= 48 //C
6 p= 18.4 //atm
7 R= 0.082 //lit-atm deg^-1 mole^-1
8 a= 3.6
9 b= 4.28*10^-2
10 //CALCULATIONS
11 P1= R*(273+T)/v
12 P2= (R*(273+T)/(v-b))-(a/v^2)
13 //RESULTS
14 printf ('Pressure by ideal gas equation = %.1f atm',
     P1)
15 printf ('\n Pressure by vander Waals equation = %.1f
     atm',P2)
```

Scilab code Exa 4.15 ex 15

```
1 clc
```

```
2 //Intitalisation of variables
3 clear
4 wa= 52.3 //gms
5 wv= 52.96 //gms
6 wb= 302 //gms
7 T= 100 //C
8 p= 752 //mm
9 d= 1.29 //g per litre
10 wa1= 0.32 //gms
11 R= 0.082 //lit-atm K^-1 mole^-1
12 v= 0.25 //lit
13 //CALCULATIONS
14 W= wb-wa
15 Wv= wv-(wa-wa1)
16 M= Wv*R*(273+T)/((p/760)*v)
17 //RESULTS
18 printf ('Molecular weight of choloform = %.f gms',M)
```

Scilab code Exa 4.16 ex 16

```
1 clc
2 //Intitalisation of variables
3 clear
4 w= 0.241 //gms
5 R= 0.082 //lit-atm mole^-1 K^-1
6 T= 23 //C
7 p= 764 //mm
8 v= 47.9 //ml of air
9 //CALCULATIONS
10 M= w*R*(273+T)/((p/760)*(v/1000))
11 //RESULTS
12 printf ('Molecular weight of choloform = %.f gms',M)
```

Scilab code Exa 4.17 ex 17

```
clc
//Intitalisation of variables
clear
p= 795 //mm
v= 0.501 //lit
w= 1.35 //gms
m= 92 //gms
R= 0.082 //lit-atm mole^-1 K^-1
T= 45 //C
//CALCULATIONS
a= ((p/760)*v/((w/m)*R*(273+T)))-1
//RESULTS
printf ('Fraction of N2O4 dissociated into NO2 = %.3
   f',a)
```

Chapter 5

Liquefication and the properties of liquids

Scilab code Exa 5.1 ex 1

```
1  clc
2  //Intitalisation of variables
3  clear
4  m1= 1.947 //gms
5  V= 10 //lit
6  T= 22 //C
7  p= 752 //mm of Hg
8  T1= 28 //C
9  W= 46 //gms
10 R= 0.082 //lit-atm mole^-1 K^-1
11 //CALCULATIONS
12 P= (m1*p/W)/((m1/W)+((p/760)*V/(R*(273+T))))
13 P1= (m1*p/W)/(((p/760)*V/(R*(273+T))))
14 P2= (m1/W)*R*(273+T)*760/V
15 //RESULTS
16 printf ('Vapour pressure of ethanol = %.1f mm',P)
17 printf ('\n Vapour pressure of ethanol = %.f mm',P1)
18 printf ('\n Vapour pressure of ethanol = %.f mm',P2)
```

Scilab code Exa 5.2 ex 2

```
clc
//Intitalisation of variables
clear
p= 27.17 //mm
T= 99.5 //C
T1= 100.5 //C
T2= 100 //C
sv1= 1674 //cc per gram
sv2= 1.04 //cc per gram
g= 980.7 //cm/sec^2
d= 13.595 //kg/m^3
//CALCULATIONS
r= (p/10)*d*g
lv= (273.2+T2)*(sv1-sv2)*(p/10)*d*g/(4.184*10^7)
//RESULTS
printf ('Heat of vapourisation of water = %.1f cal g
   ^-1',lv)
```

Scilab code Exa 5.3 ex 3

```
clc
//Intitalisation of variables
clear
T= 100 //C
v1= 1674 //cc
v2= 1 //cc
lv= 539.9 //cal g^-1
sp= 13.595 //kg/m63
g= 980 //cm/sec^2
//CALCULATIONS
```

```
11 r= (273.2+T)*(v1-v2)*sp*g/(lv*4.187*10^7)
12 Tf= T+r
13 //RESULTS
14 printf ('Final temperature = %.2f C',Tf)
```

Scilab code Exa 5.4 ex 4

```
1 clc
2 //Intitalisation of variables
3 clear
4 R= 2 //cal mole^-1 K^-1
5 r= 2.72 //cm of mercury per degree
6 p= 76 //cm of mercury
7 T= 100 //C
8 m= 18 //gms
9 //CALCULATIONS
10 Lv= R*(273+T)^2*r/(m*p)
11 //RESULTS
12 printf ('heat of vapourisation = %.f cal g^-1',Lv)
```

Scilab code Exa 5.5 ex 5

```
1 clc
2 //Intitalisation of variables
3 clear
4 vp= 526 //mm
5 T= 90 //C
6 T1= 100 //C
7 hv= 542 //cal/gm
8 m= 18 //gm
9 //CALCULATIONS
10 p2= vp*10^(hv*m*(T1-T)/((273+T)*4.576*(273+T1)))
11 //RESULTS
```

```
12 printf ('Vapour pressure of water at 100 C = %.f mm'
   ,p2)
```

Scilab code Exa 5.6 ex 6

```
1  clc
2  //Intitalisation of variables
3  clear
4  p= 770 //mm
5  T= 100.37 //C
6  p1= 1 //atm
7  c= 0.0001
8  T1= 100 //C
9  //CALCULATIONS
10 dt= c*(273+T1)*(760-p)
11 cbp= T+dt
12 //RESULTS
13 printf ('Change boiling point = %.2f C',dt)
14 printf ('\n Corrected boiling point = %.2f C',cbp)
```

Scilab code Exa 5.7 ex 7

```
1  clc
2  //Intitalisation of variables
3  clear
4  d= 0.7910 //kg/cm^3
5  T= 20 //C
6  mw= 58.08 //gm
7  x1= 7.2 //gm
8  x2= 16.2 //gm
9  x3= 20 //gm
10 x4= 23.2 //gm
11 n1= 3 //atoms
```

```
12 n2= 6 //atoms
13 //CALCULATIONS
14 r= ((n1*x1+n2*x2+x3+x4)*d/mw)^4
15 //RESULTS
16 printf ('Surface tension of acetone = %.1f dynes cm
     ^-1',r)
```

Scilab code Exa 5.8 ex 8

```
1 clc
2 //Intitalisation of variables
3 clear
4 r1= 1.3591
5 d= 0.791 //kg/m^3
6 mw= 58.08 //gms
7 x1= 2.42 //gm
8 x2= 1.10 //gm
9 x3= 2.21 //gm
10 n1= 3 //atoms
11 n2= 6 //atoms
12 //CALCULATIONS
13 MR= (r1^2-1)*mw/(d*(r1^2+2))
14 cv= x1*n1+x2*n2+x3
15 //RESULTS
16 printf ('Molar refraction of this substance = %.2f
     cc',MR)
17 printf ('\n Calculated value of Molar refraction of
     this substance = %.2f cc',cv)
```

Scilab code Exa 5.9 ex 9

```
1 clc
2 //Intitalisation of variables
```

```
clear
dc= 2.033
d= 0.7784 //kg/m^3
mw= 84.16 //gm
x1= 2.42 //gm
x2= 1.1 //gm
n1= 6 //atoms
n2= 12 //atoms
//CALCULATIONS
MP= (dc-1)*mw/((dc+2)*d)
MPC= x1*n1+x2*n2
//RESULTS
printf ('Molar polarisation of this substance = %.2f
    cc',MP)
printf ('\n Calculated Molar polarisation of this
   substance = %.2f cc',MPC)
```

Chapter 6

The Solid state

Scilab code Exa 6.1 ex 1

```
clc
//Intitalisation of variables
clear
d1= 5.9 //deg
d2= 5.3 //deg
//CALCULATIONS
r= sind(d1)/sind(d2)
vr= r^3
//RESULTS
printf ('Ratio of inter planar distance = %.2f ',r)
printf ('\n Ratio of volumes = %.2f ',vr)
```

Scilab code Exa 6.2 ex 2

```
clc
//Intitalisation of variables
clear
svl= 1.0001 //cc/gram
```

```
svi= 1.0907 //cc/gram
T= 0//C
Hf= 79.8 //cal/gram
p= 76 //mm
sp= 13.595
g= 980.7 //cm/sec^2
//CALCULATIONS
r= -(273.2+T)*(svl-svi)*p*sp*g/(Hf*4.184*10^7)
//RESULTS
printf ('Decrease in melting point = %.4f per atm',r
   )
```

Chapter 7

Thermodynamics and thermochemistry

Scilab code Exa 7.1 ex 1

```
clc
//Intitalisation of variables
clear
v= 1 //cc
p= 1.013*10^6 //dyne cm^-2
r= 4.184*10^7 //ergs
//CALCULATIONS
W= v*p/r
//RESULTS
printf ('Work done = %.4f cal',W)
```

Scilab code Exa 7.2 ex 2

```
clc
//Intitalisation of variables
clear
```

```
4 R= 8.314 //J/mole K
5 n= 1 //mole
6 v1= 10 //lit
7 v2= 20 //lit
8 T= 25 //C
9 //CALCULATIONS
10 W= R*10^7*(273.2+T)*log(v2/v1)
11 //RESULTS
12 printf ('Maximum work done = %.3e ergs mole^-1',W)
```

Scilab code Exa 7.3 ex 3

```
1 clc
2 //Intitalisation of variables
3 clear
4 T= 18 //C
5 n1= 7.5
6 n2= 3
7 n3= 6
8 R= 2*10^-3 //kcal
9 dH= -783.4 //kcal
10 //CALCULATIONS
11 dE= dH+R*(273+T)*(n2+n3-n1)
12 //RESULTS
13 printf ('Heat of the reaction = %.1f kcal',dE)
```

Scilab code Exa 7.4 ex 4

```
1 clc
2 //Intitalisation of variables
3 clear
4 dH= -256.2 //kcal
5 hf= -98.3 //kcal
```

```
6 n= 6
7 //CALCULATIONS
8 x= n*hf-dH
9 //RESULTS
10 printf ('Heat of the formation = %.1f kcal',x)
```

Scilab code Exa 7.5 ex 5

```
1 clc
2 //Intitalisation of variables
3 clear
4 dH= -327 //kcal
5 n1= 2 //moles
6 n2= 3 //moles
7 hf= 68.4 //kcal
8 hf1= 94 //kcal
9 //CALCULATIONS
10 x= -n1*hf1-n2*hf-dH
11 //RESULTS
12 printf ('Heat of the formation = %.1f kcal',x)
```

Scilab code Exa 7.6 ex 6

```
1 clc
2 //Intitalisation of variables
3 clear
4 n= 5 //moles
5 h1= 10.55 //kcal
6 h2= -18.69 //kcal
7 //CALCULATIONS
8 dH= h2-n*h1
9 //RESULTS
10 printf ('Heat of the hydration = %.2f kcal',dH)
```

Scilab code Exa 7.7 ex 7

```
clc
//Intitalisation of variables
clear
cp= 18 //cal/deg
co2= 6.97 //cal/deg
ch2= 6.89 //cal/deg
T1= 25 //C
T2= 100 //C
dH1= -68.4 //kcal
//CALCULATIONS
dCp= (cp-(co2*0.5+ch2))*10^-3
dH2= dH1+(T2-T1)*dCp
//RESULTS
printf ('dCp = %.2e kcal deg^-1',dCp)
printf ('\n Heat of formation = %.1f kcal',dH2)
```

Scilab code Exa 7.8 ex 8

```
clc
//Intitalisation of variables
clear
k1= 9.92 //kcal/deg
T2= 125 //C
T1= 25 //C
k2= 1.15*10^-3 //kcal deg^-2
k3= 3.4*10^-6 //kcal deg^-3
dH1= -22.1 //kcal
//CALCULATIONS
dH= 10^-3*(-k1*(T2-T1)-k2*((273+T2)^2-(273+T1)^2)+k3
   *((273+T2)^3-(273+T1)^3))
```

```
12 dH2= dH1+dH
13 //RESULTS
14 printf ('dH2-dH1 = %.2f kcal',dH)
15 printf ('\n Heat of reaction = %.2f kcal',dH2)
```

Scilab code Exa 7.9 ex 9

```
1 clc
2 //Intitalisation of variables
3 clear
4 a= -9.92
5 b= -2.3*10^-3
6 c= 10.2*10^-6
7 T= 25 //C
8 dH= -22100 //cal
9 //CALCULATIONS
10 dH1= dH-(a*(273+T)+b*0.5*(273+T)^2+c*0.33*(273+T)^3)
11 //RESULTS
12 printf ('Heat of reaction = %.f cal',dH1+1)
```

Scilab code Exa 7.10 ex 10

```
1 clc
2 //Intitalisation of variables
3 clear
4 m= 1.247 //gm
5 hc= 2745 //cal deg^-1
6 mw= 122.12 //gm
7 dT= 2.87 //C
8 //CALCULATIONS
9 mh= dT*hc*mw/(m*1000)
10 //RESULTS
```

```
11 printf ('molar heat of combustion of benzoic acid =
     %.1f kcal mole^-1',mh)
```

Chapter 8

The second law of thermodynamics

Scilab code Exa 8.1 ex 1

```
clc
//Intitalisation of variables
clear
k1= 8.04 //cal deg^-1 mole^-1
k2= 7*10^-4 //cal deg^-2 mole^-1
k3= 5.1*10^-6 //cal deg^-3 mole^-1
T1= 125 //C
T2= 25 //C
cv= 8.92 //cal deg^-1 mole^-1
//CALCULATIONS
dSp= k1*log((273+T1)/(273+T2))+k2*(T1-T2)+k3
   *0.5*((273+T1)^2-(273+T2)^2)
dSp1=  cv*log((273+T1)/(273+T2))
//RESULTS
printf ('Increase in entropy = %.2f cal deg^-1 mole
   ^-1',dSp)
printf ('\n Increase in entropy = %.2f cal deg^-1
   mole^-1',dSp1)
```

Scilab code Exa 8.2 ex 2

```
clc
//Intitalisation of variables
clear
m= 18 //gm
T= 100 //C
T1= 0 //C
hv= 9720 //cal
s= 0.36 //cal deg^-1 mole^-1
//CALCULATIONS
dS= m*log((273+T)/(273+T1))
dS1= 2*dS+(hv/(273+T))-s
//RESULTS
printf ('Increase in entropy = %.2f cal deg^-1 mole
   ^-1',dS)
printf ('\n Total increase in entropy = %.2f cal deg
   ^-1 mole^-1',dS1)
```

Scilab code Exa 8.3 ex 3

```
clc
//Intitalisation of variables
clear
T2= 100 //C
T1= 0 //C
T3= 357 //C
T4= 25 //C
//CALCULATIONS
e1= (T2-T4)/(273+T2)
e2= (T3-T4)/(273+T3)
//RESULTS
```

```
12 printf ('Efficiency = %.3f ',e1)
13 printf ('\n Efficiency = %.3f ',e2)
```

Scilab code Exa 8.4 ex 4

```
1 clc
2 //Intitalisation of variables
3 clear
4 R= 1.987 //cal
5 T= 25 //C
6 p= 23.76 //mm
7 //CALCULATIONS
8 dF= R*(273.2+T)*log(760/p)
9 //RESULTS
10 printf ('Free energy change = %.f cal mole^-1',dF+1)
```

Chapter 9

Dilute Solutions

Scilab code Exa 9.1 ex 1

```
clc
//Intitalisation of variables
clear
p1= 17.535 //mm
p2= 17.226 //mm
M= 100 //gms
m1= 18.02 //gms
m2= 18.04 //gms
//CALCULATIONS
M= (-1+(p1/(p1-p2)))*m1*m2/M
//RESULTS
printf ('Molecular weight of mannitol = %.f gms',M)
printf ('\n Correct Molecular weight of mannitol = %
    .f gms',M+1)
```

Scilab code Exa 9.2 ex 2

```
clc
```

```
2 //Intitalisation of variables
3 clear
4 dT= 0.170 //C
5 M2= 60.06 //gms
6 w1= 22.5 //gms
7 w2= 0.45 //gms
8 R= 1.987 //cal
9 T= 100 //C
10 lv= 539.9 //cal g^-1
11 //CALCULATIONS
12 Kb= dT*M2*w1/(1000*w2)
13 Kb1= R*(273.2+T)^2/(lv*1000)
14 //RESULTS
15 printf ('Eleveation constant of water = %.3f ',Kb)
16 printf ('\n Eleveation constant of water = %.3f ',
   Kb1)
```

Scilab code Exa 9.3 ex 3

```
1 clc
2 //Intitalisation of variables
3 clear
4 Kf= 5.12
5 m= 0.911 //gms
6 m1= 50 //gms
7 dT= 0.603 //deg
8 //CALCULATIONS
9 M2= Kf*1000*m/(m1*dT)
10 //RESULTS
11 printf ('Molecular weight of carbon tetra chloride =
    %.f gms',M2)
```

Scilab code Exa 9.4 ex 4

```
clc
//Intitalisation of variables
clear
m= 4 //gms
p= 6.4*10^-4 //atm
T= 27 //C
R= 0.082 //lit atm deg^-1 mole^-1
//CALCULATIONS
M= R*(273+T)*m/p
//RESULTS
printf ('Molecular weight of polymer = %.1e gms',M)
```

Scilab code Exa 9.5 ex 5

```
clc
//Intitalisation of variables
clear
v1= 18.10 //cc
T= 100 //C
p= 2.47 //atm
L= 539.9 //cal mole^-1 gm^-1
m= 18.02 //gm
T1= 30 //C
//CALCULATIONS
dT= v1*(273.2+T)^2*p*1.013*10^6/(L*m
   *4.184*10^7*(273.2+T1))
//RESULTS
printf ('Elevation of boiling point = %.4f degrees',
   dT)
```

Scilab code Exa 9.6 ex 6

```
clc
```

```
2 //Intitalisation of variables
3 clear
4 dt= 0.0265 //deg
5 c= 5*10^-3 //M
6 kf= 1.86 //deg
7 //CALCULATIONS
8 i= dt/(c*kf)
9 //RESULTS
10 printf ('i of the solution = %.2f ',i)
```

Chapter 10

Chemical Equillibrium

Scilab code Exa 10.1 ex 1

```
clc
//Intitalisation of variables
clear
Kp= 1.44*10^-5 //atm
R= 0.082 //lit-atm mole^-1 deg^-1
T= 500 //C
//CALCULATIONS
Kc= Kp/((273+T)*R)^-2
//RESULTS
printf ('Kc = %.2e moles per litre ',Kc)
```

Scilab code Exa 10.2 ex 2

```
clc
//Intitalisation of variables
clear
n1= 2.16*10^-2 //mole
n2= 2.46*10^-2 //mole
```

```
6 //CALCULATIONS
7 y= (n1+n2)/2
8 //RESULTS
9 printf ('moles of HI present = %.2e mole ',y)
```

Scilab code Exa 10.3 ex 3

```
1 clc
2 //Intitalisation of variables
3 clear
4 kc= 0.719
5 T= 1000 //K
6 n= 1 //mole
7 //CALCULATIONS
8 r= sqrt(kc)
9 p= r*100/(2*r+2*n)
10 p1= 50-p
11 //RESULTS
12 printf ('CO precentage = %.2f per cent ',p)
13 printf ('\n H2O precentage = %.2f per cent ',p)
14 printf ('\n CO2 precentage = %.2f per cent ',p1)
15 printf ('\n HH2 precentage = %.2f per cent ',p1)
```

Scilab code Exa 10.4 ex 4

```
1 clc
2 //Intitalisation of variables
3 clear
4 Kp =0.315
5 P= 10 //atm
6 //CALCULATIONS
7 a= sqrt(Kp/(4*P+Kp))
8 //RESULTS
```

```
9 printf ('Fraction of dissociation = %.4f  ',a)
```

Scilab code Exa 10.5 ex 5

```
1  clc
2  //Intitalisation of variables
3  clear
4  p= 10 //atm
5  x1= 0.012
6  x2= 0.104
7  //CALCULATIONS
8  kp1= 256*x1^2/(27*(1-x1)^4*p^2)
9  p1= sqrt(256*x2^2/(kp1*27*(1-x2)^4))
10 //RESULTS
11 printf ('Kp = %.2e  ',kp1)
12 printf ('\n Pressure at equillibrium = %.f atm  ',p1
   )
```

Scilab code Exa 10.6 ex 6

```
1  clc
2  //Intitalisation of variables
3  clear
4  Kp= 1.78 //atm
5  n= 0.04 //mole
6  p= 2 //atm
7  x= 0.041
8  v= 4 //lit
9  x1= 0.0692
10 //CALCULATIONS
11 y= x/p
12 a= y/n
13 y1= x1/v
```

```
14 a1= y1/x
15 //RESULTS
16 printf ('Number of moles = %.4f moles',y)
17 printf ('\n Fraction of dissociation = %.3f ',a)
18 printf ('\n Number of moles = %.4f moles',y1)
19 printf ('\n Fraction of dissociation = %.3f ',a1
   +0.01)
```

Scilab code Exa 10.7 ex 7

```
1 clc
2 //Intitalisation of variables
3 clear
4 Kx= 4
5 y1= 7.8 //per cent
6 //CALCULATIONS
7 y= ((2*(Kx+1)-sqrt(4*(Kx+1)^2-4*(Kx-1)*Kx))*100/(2*(
   Kx-1)))+y1
8 //RESULTS
9 printf ('per cent of acid that is esterified = %.1f
   per cent ',y)
```

Scilab code Exa 10.8 ex 8

```
1 clc
2 //Intitalisation of variables
3 clear
4 Kc= 1.08*10^-5
5 n= 2 //moles
6 v= 0.45 //lit
7 n1= 0.5 //mole
8 //CALCULATIONS
9 y= (-Kc*v+sqrt(Kc^2*v^2+4*Kc*v*n1*n^2))/(2*n^2)
```

```
10 c= 2*y/v
11 //RESULTS
12 printf ('y = %.2e mole',y)
13 printf ('\n concentration of NO2 = %.2e mole per
      liter',c)
```

Scilab code Exa 10.9 ex 9

```
1 clc
2 //Intitalisation of variables
3 clear
4 T1= 500 //C
5 T2= 400 //C
6 kp1= 1.64*10^-4
7 kp2= 0.144*10^-4
8 R= 4.576 //cal
9 //CALCULATIONS
10 dH= (log10(kp2)-log10(kp1))*R*(273+T1)*0.5*(273+T2)
      /(T1-T2)
11 //RESULTS
12 printf ('Heat of formation of one mole of Nh3 = %.f
      cal ',dH+5)
```

Scilab code Exa 10.10 ex 10

```
1 clc
2 //Intitalisation of variables
3 clear
4 p1= 141 //mm
5 p2= 387 //mm
6 n1= 2 //moles
7 n2= 1 //moles
8 T1= 653 //K
```

```
T2= 693 //K
x1= 159.6 //mm
//CALCULATIONS
Phg= 2*p1/3
Po2= 0.5*Phg
Phg1= 2*p2/3
Po21= 0.5*Phg1
Kp1= Phg^2*Po2
Kp2= Phg1^2*Po21
dH= log10(Kp2/Kp1)*4.576*T1*T2/(T2-T1)
Kp3= (x1*2)^2*x1
T3= 1/((log10(Kp1/Kp3)*4.576/(dH+9))+(1/T1))
T4= T3-273
//RESULTS
printf ('PHg = %.f mm',Phg)
printf ('\n PO2 = %.f mm',Po2)
printf ('\n PHg = %.f mm',Phg1)
printf ('\n PO2 = %.f mm',Po21)
printf ('\n Kp1 = %.2e',Kp1)
printf ('\n Kp2 = %.2e',Kp2)
printf ('\n dH = %.f cal',dH+9)
printf ('\n T3 = %.f K',T3)
printf ('\n T4 = %.f C',T4)
```

Chapter 11

Free energy and chemical equillibrium

Scilab code Exa 11.1 ex 1

```
clc
//Intitalisation of variables
clear
p1= 1 //atm
p2= 0.1 //atm
p3= 0.1 //atm
R= 1.987 //cal mole^-1 K^-1
T= 2000 //K
Kp= 1.55*10^7
//CALCULATIONS
Qp= p1/(p2^2*p3)
dF= 2.303*R*T*log10(Qp/Kp)/1000
dF1= -2.303*R*T*log10(Kp)/1000
//RESULTS
printf ('free energy change = %.2f kcal ',dF)
printf ('\n free energy change = %.2f kcal ',dF1)
```

Scilab code Exa 11.2 ex 2

```
clc
//Intitalisation of variables
clear
T= 500 //C
Kp= 1.43*10^-5 //atm
R= 1.987 //cal
//CALCULATIONS
dF= -2.303*R*(273+T)*log10(Kp)
//RESULTS
printf ('dF = %.f cal ',dF+3)
```

Scilab code Exa 11.3 ex 3

```
clc
//Intitalisation of variables
clear
n1= 2 //moles
n2= 2 //moles
n3= 1 //mole
h1= 54.6 //cal
h2= 7.8 //cal
h3= -69.6 //cal
R= 1.987 //cal
T= 25 //C
//CALCULATIONS
dF= -n1*h1-(-n2*h2+n3*h3)
Kp= 10^(-dF*1000/(2.303*R*(273.2+T)))
//RESULTS
printf ('dF = %.f kcal ',dF)
printf ('\n equillibrium constant = %.1e ',Kp)
```

Scilab code Exa 11.4 ex 4

```
clc
//Intitalisation of variables
clear
dH= 12300 //cal
T= 25 //C
dS= -60.1 //cal deg^-1 mole^-1
//CALCULATIONS
dF= dH-dS*(273+T)
//RESULTS
printf ('Standard free energy of formation = %.f cal
    mole^-1 ',dF-10)
```

Chapter 12

Phase equilibria

Scilab code Exa 12.1 ex 1

```
clc
//Intitalisation of variables
clear
k1= 0.015
k2= 0.028
p1= 0.7806 //atm
p2= 0.21 //atm
//CALCULATIONS
P1= k1*p1*100/(k1*p1+k2*p2)
P2= 100-P1
//RESULTS
printf ('moles of Nitrogen = %.1f moles',P1)
printf ('\n moles of Oxygen = %.1f moles',P2)
```

Scilab code Exa 12.2 ex 2

```
clc
//Intitalisation of variables
```

```
clear
Ma= 153.8 //gms
Mb= 169.9 //gms
pa= 114.9 //mm
pb= 238.3 //mm
//CALCULATIONS
xa= (1/Ma)/((1/Ma)+(1/Mb))
xb= 1-xa
Pa= pa*xa
Pb= pb*xb
Pt= Pa+Pb
//RESULTS
printf ('PA = %.1f mm',Pa)
printf ('\n PB = %.1f mm',Pb)
printf ('\n Total vapour pressure = %.1f mm',Pt)
```

Scilab code Exa 12.3 ex 3

```
clc
//Intitalisation of variables
clear
pa= 114.9 //mm
pb= 238.3 //mm
xa= 0.525
xb= 0.475
//CALCULATIONS
xa1= xa*pa/((xa*pa)+(xb*pb))
xb1= 1-xa1
//RESULTS
printf ('Mole fraction CCl4 = %.3f ',xa1)
printf ('\n Mole fraction of SiCl4 = %.3f ',xb1)
```

Scilab code Exa 12.4 ex 4

```
clc
//Intitalisation of variables
clear
p1= 55 //per cent
P1= 744 //mm
P2= 634 //mm
MB= 18 //gms
//CALCULATIONS
MA= p1*P2*MB/((P1-P2)*(100-p1))
//RESULTS
printf ('Molecular weight of terpinene = %.f gms',MA
   )
```

Scilab code Exa 12.5 ex 5

```
clc
//Intitalisation of variables
clear
ci= 0.1896 //mole per liter
cKI= 0.02832 //mole per liter
r= 625
//CALCULATIONS
CI2= ci/r
dc= cKI-CI2
//RESULTS
printf ('Conc of I2 in KI layer = %.6f mole per
   litre',CI2)
printf ('\n Conc of I3- ions = %.5f mole per litre',
   dc)
```

Chapter 13

The conductance of Electrolytes

Scilab code Exa 13.1 ex 1

```
clc
//Intitalisation of variables
clear
F= 96500 //coulombs
t= 3600 //sec
n= 0.75 //mole
v= 22.4 //lit
v1= 0.336 //lit
//CALCULATIONS
cs= F*v1/(n*v*t)
//RESULTS
printf ('Current strength = %.3f amp',cs)
```

Scilab code Exa 13.2 ex 2

```
clc
```

```
2 //Intitalisation of variables
3 clear
4 m= 1.9768 //gms
5 M= 107.88 //gms
6 m1= 5.136 ///gms
7 M1= 74.56 //gms
8 x1= 100 //gms
9 x2= 3.65 //gms
10 M2= 122.93 //gms
11 //CALCULATIONS
12 n1= m/M
13 n2= m1/M1
14 n3= (x2/M1)*(M2-m1)/(x1-x2)
15 t= (n3-n2+n1)/n1
16 t1= 1-t
17 //RESULTS
18 printf ('number of g equiv of Ag deposited = %.5f ',
   n1)
19 printf ('\n number of g equiv of Ag deposited = %.5f
    ',n2)
20 printf ('\n number of g equiv of KCl deposited = %.5
   f g equiv of KCl',n3)
21 printf ('\n transference number = %.3f ',t1-0.003)
```

Scilab code Exa 13.3 ex 3

```
1 clc
2 //Intitalisation of variables
3 clear
4 l= 5.6 //cm
5 F= 96500 //coloumbs
6 A= 0.1142 //cm^2
7 t= 2130 //sec
8 i= 0.005893 //amp
9 m= 10^-4 //gms
```

```
10 //CALCULATIONS
11 t= 1-(l*A*F*m/(i*t))
12 //RESULTS
13 printf ('Transference number = %.3f ',t)
```

Scilab code Exa 13.4 ex 4

```
1
2 clc
3 //Intitalisation of variables
4 clear
5 k= 0.012856 //ohm^-1 cm^-1
6 R= 3468.9 //ohms
7 k1= 44.597 //cm^-1
8 c= 0.1 //g equiv per litre
9 R1= 4573.6 //ohms
10 //CALCULATIONS
11 k1= k*R
12 K= k1/R1
13 a= 1000*K/c
14 //RESULTS
15 printf ('cell constant = %.3f cm^-1',k1)
16 printf ('\n cell constant = %.5f ohm^-1 cm^-1',K)
17 printf ('\n Equivalent conductance = %.2f ohms^-1 cm
   ^2',a)
```

Scilab code Exa 13.5 ex 5

```
1 clc
2 //Intitalisation of variables
3 clear
4 A= 48.15 //ohm^-1 cm6-1
5 m= 1.0283*10^-3 //gms equiv acid per litre
```

```
A0= 390.7 //ohms^-1 cm^2
A1= 60.2
B= 0.229
//CALCULATIONS
a= A/(A0-(A1+B*A0)*sqrt((A/A0)*m))
//RESULTS
printf ('Degree of dissociation = %.4f',a)
```

Scilab code Exa 13.6 ex 6

```
clc
//Intitalisation of variables
clear
t= 0.3965
A0= 126.45 //ohm^-1 CM62
//CALCULATIONS
l= (1-t)*A0
//RESULTS
printf ('ion conductance of the Cl- ion = %.2f ohms
   ^-1 cm^2',l)
```

Scilab code Exa 13.7 ex 7

```
clc
//Intitalisation of variables
clear
A1= 426.16 //ohms^-1 cm^2
A2= 91 //ohms^-1 cm^2
A3= 126.45 //ohms^-1 cm^2
a1= 61.92 //ohms^-1 cm^2
a2= 76.34 //ohms^-1 cm^2
a3= 63.64 //ohms^-1 cm^2
a4= 79.8 //ohms^-1 cm^2
```

```
11 //CALCULATIONS
12 A4= A1+A2-A3
13 A5= a1+a2
14 A6= a3+a4
15 //RESULTS
16 printf ('Conductance of CH3COOH = %.1f ohms^-1 cm^2'
      ,A4)
17 printf ('\n Conductance of AgCl = %.1f ohms^-1 cm^2'
      ,A5)
18 printf ('\n Conductance of BaSO4 = %.1f ohms^-1 cm^2
      ',A6)
```

Scilab code Exa 13.8 ex 8

```
1 clc
2 //Intitalisation of variables
3 clear
4 e= 5.6 //volts
5 l= 9.8 //cm
6 t= 1 //hr
7 T= 25 //C
8 A= 73.4 //ohm^-1 cm^2
9 F= 96500 //coloumbs
10 //CALCULATIONS
11 v= A/F
12 pg= e/l
13 v1= v*pg
14 L= v1*t*3600
15 //RESULTS
16 printf ('Mobility = %.2e cm/sec',v)
17 printf ('\n Potential gradient = %.3f volt/cm',pg)
18 printf ('\n Potential gradient = %.3f volt/cm',pg)
19 printf ('\n Distance moved by ion = %.2f cm',L)
```

Scilab code Exa 13.9 ex 9

```
clc
//Intitalisation of variables
clear
Ao= 138.3 //ohms^-1
k1= 3.41*10^-6 //ohm^-1 cm^-1
k2= 1.6*10^-6 //ohm^-1 cm^-1
T= 25 //C
//CALCULATIONS
s= 1000*(k1-k2)/Ao
//RESULTS
printf ('Solubility of AgCl in water = %.2e g equiv
   per liter',s)
```

Chapter 14

Electromotive Force

Scilab code Exa 14.1 ex 1

```
1  clc
2  //Intitalisation of variables
3  clear
4  T= 25 //C
5  E= 0.0455 //volt
6  r= 3.38*10^-4 //volt degree^-1
7  F= 96500
8  r1= 0.2390
9  //CALCULATIONS
10 dH= -F*r1*(E-(273+T)*r)
11 //RESULTS
12 printf ('Enthalpy = %.f calories ',dH)
```

Scilab code Exa 14.2 ex 2

```
1  clc
2  //Intitalisation of variables
3  clear
```

```
4 emf= 1.094 //volt
5 e1= 0.334 //volt
6 //CALCULATIONS
7 Ezn= (emf-e1)
8 //RESULTS
9 printf ('Ezn = %.3f volt ',Ezn)
```

Scilab code Exa 14.3 ex 3

```
1 clc
2 //Intitalisation of variables
3 clear
4 emf= 0.0455 //volt
5 T= 25 //C
6 c= 0.1 //N
7 emf1= 0.334 //volt
8 emf2= 0.799 //volt
9 k= 0.05915
10 //CALCULATIONS
11 ag= 10^((-emf2+(emf1-emf))/k)
12 //RESULTS
13 printf ('aAg+ = %.2e g ion per 1000 grams per litre
    ',ag)
```

Scilab code Exa 14.4 ex 4

```
1 clc
2 //Intitalisation of variables
3 clear
4 k= 0.059
5 e= -0.401 //volt
6 c1= 10^-14 // g ion per litre
7 c2= 10^-7 // g ion per litre
```

```
8  //CALCULATIONS
9  E1= e+k*log10(c1)
10 E2= e+k*log10(c2)
11 //RESULTS
12 printf ('oxidation potential = %.2f volt ',E1)
13 printf ('\n oxidation potential = %.2f volt ',E2)
```

Scilab code Exa 14.5 ex 5

```
1  clc
2  //Intitalisation of variables
3  clear
4  e= 0.761 //volt
5  e1= -0.34 //volt
6  k= 0.02958 //volt
7  //CALCULATIONS
8  r= 10^((e-e1)/k)
9  //RESULTS
10 printf ('K for the reaction = %.1e  ',r)
```

Scilab code Exa 14.6 ex 6

```
1  clc
2  //Intitalisation of variables
3  clear
4  c1= 0.1 //M
5  c2= 0.01 //M
6  k= 0.05915 //volt
7  t1= 0.172
8  t2= 0.828
9  //CALCULATIONS
10 El= (t1-t2)*k*log10(c2/c1)
11 //RESULTS
```

```
12 printf ('Liquid junction potential = %.3f   ',El)
```

Scilab code Exa 14.7 ex 7

```
1  clc
2  //Intitalisation of variables
3  clear
4  k= 0.05915 //volt
5  n= 2 //moles
6  c= 0.1 //M
7  c1= 1 //M
8  //CALCULATIONS
9  r= k*log10(c/c1)/n
10 //RESULTS
11 printf ('EMF = %.5f volt ',r)
```

Scilab code Exa 14.8 ex 8

```
1  clc
2  //Intitalisation of variables
3  clear
4  e1= 0.31 //volt
5  e2= 0.78 //volt
6  //CALCULATIONS
7  e= e1+e2
8  //RESULTS
9  printf ('Decomposition voltage = %.2f   ',e)
```

Scilab code Exa 14.9 ex 9

```
clc
//Intitalisation of variables
clear
k= 0.059 //volt
c= 10^-7 //M
e= 2.71 //volt
c1= 6 //M
e1= -0.4 //volt
e2= -1.36 //volt
e3= 0.6 //volt
//CALCULATIONS
E1= -log10(c)*k
E2= e-k*log10(c1)
E3= e1+k*log10(c)
E4= e2+k*log10(c1)
E5= E3-e3
//RESULTS
printf ('EH = %.2f volt ',E1)
printf ('\n ENa = %.2f volt ',E2)
printf ('\n EO = %.2f volt ',E3)
printf ('\n ECl = %.2f volt ',E4)
printf ('\n Oxygen evolution potential = %.2f volt '
   ,E5)
```

Chapter 15

Equilibria in electrolytes

Scilab code Exa 15.1 ex 1

```
clc
//Intitalisation of variables
clear
c1= 0.1 //M
c2= 0.2 //M
c3= 0.4 //M
n1= 1
n2= 2
//CALCULATIONS
u1= 0.5*(c1*n1^2+c1*n1^2)
u2= 0.5*(c3*n1^2+c2*n2^2)
u3= 0.5*((c3+c1)*n1^2+c1*n1^2+c2*n2^2)
//RESULTS
printf ('Ionic strength = %.1f  ',u1)
printf ('\n Ionic strength = %.1f  ',u2)
printf ('\n Ionic strength = %.1f  ',u3)
```

Scilab code Exa 15.2 ex 2

```
clc
//Intitalisation of variables
clear
c1= 0.01 //M
c2= 0.001 //M
n= 2 //moles
k= -0.509
n1= 1 //moles
//CALCULATIONS
f1= 10^(k*sqrt(c1))
f2= 10^(k*n*sqrt((c2*(n+n1))))
//RESULTS
printf ('activity coefficient = %.3f  ',f1)
printf ('\n activity coefficient = %.3f  ',f2)
```

Scilab code Exa 15.3 ex 3

```
clc
//Intitalisation of variables
clear
a= 6.4*10^-6 //g ion per lit
a1= 0.05
n= 2
//CALCULATIONS
Ksp= a^2*a1
s= (Ksp/n^2)^(1/3)
//RESULTS
printf ('Ks = %.2e ',Ksp)
printf ('\n solubility of Ag2CrO4 = %.2e mole per
   litre',s)
```

Scilab code Exa 15.4 ex 4

```
clc
//Intitalisation of variables
clear
s1= -0.0059 //mole per litre
x1= 0.0118 //mole per lit
x2= 0.0269 //mole per litre
//CALCULATIONS
S= s1+sqrt(0.25*x1^2+x2^2)
//RESULTS
printf ('Solubility = %.4f mole per litre',S)
```

Scilab code Exa 15.5 ex 5

```
clc
//Intitalisation of variables
clear
Ka= 1.752*10^-5
c= 0.1 //M
//CALCULATIONS
ch= sqrt(Ka*c)
ch1= -0.5*Ka+sqrt(Ka*c)
r= ch1/c
//RESULTS
printf ('CH+ = %.3e g ion per litre',ch)
printf ('\n CH+ = %.3e g ion per litre',ch1)
printf ('\n degree of dissociation = %.2e ',r)
```

Scilab code Exa 15.6 ex 6

```
clc
//Intitalisation of variables
clear
c1= 0.1 //M
```

```
5 cs= 0.05 //M
6 Ka= 1.75*10^-5
7 //CALCULATIONS
8 ch= Ka*c1/cs
9 //RESULTS
10 printf ('CH+ = %.1e g ion per litre',ch)
```

Scilab code Exa 15.7 ex 7

```
1 clc
2 //Intitalisation of variables
3 clear
4 ch= 5.46*10^-5 //g ion per litre
5 ph= 8.752
6 //CALCULATIONS
7 pH= -log10(ch)
8 ch1= 10^(-ph)
9 //RESULTS
10 printf ('pH = %.3f',pH)
11 printf ('\n Hydrogen ion concentration = %.3e g ion
   per litre',ch1)
```

Scilab code Exa 15.8 ex 8

```
1 clc
2 //Intitalisation of variables
3 clear
4 pt= 14
5 ph= 4.75
6 //CALCULATIONS
7 coh= 10^(-(pt-ph))
8 //RESULTS
9 printf ('COH- = %.2e g ion per litre',coh)
```

Chapter 16

Hydrolysis and Neutralization

Scilab code Exa 16.1 ex 1

```
clc
//Intitalisation of variables
clear
c= 0.01 //M
T= 25 //C
kw= 1.01*10^-14
ka= 1.75*10^-5
//CALCULATIONS
x= sqrt(kw/(ka*c))
//RESULTS
printf ('Degree of hydrolysis = %.1e ',x)
```

Scilab code Exa 16.2 ex 2

```
clc
//Intitalisation of variables
clear
c= 0.01 //M
```

```
5 ka= 1.75*10^-5
6 pkw= 14
7 ka1= 1.79
8 //CALCULATIONS
9 pH= 0.5*pkw-0.5*log(ka)+0.5*log(c)-ka1
10 //RESULTS
11 printf ('pH of solution = %.2f ',pH)
```

Scilab code Exa 16.3 ex 3

```
1 clc
2 //Intitalisation of variables
3 clear
4 k1= 10^-14
5 c= 0.1 //M
6 pH= 8.88
7 cH= 1.32*10^-9 //gms
8 //CALCULATIONS
9 x= k1/(c*cH)
10 kh= c*x^2
11 //RESULTS
12 printf ('x = %.2e ',x)
13 printf ('\n Hydrolysis constant = %.2e ',kh)
```

Scilab code Exa 16.4 ex 4

```
1 clc
2 //Intitalisation of variables
3 clear
4 c= 0.0156 //M
5 ec= 111.5 //ohm^-1 cm^2
6 ac= 99.9 //ohm^-1 cm^2
7 ac1= 426 //ohm^-1 cm^2
```

```
kw= 10^-14
//CALCULATIONS
x= (ec-ac)/(ac1-ac)
kh= c*x^2/(1-x)
kb= kw/kh
//RESULTS
printf ('x = %.4f ',x)
printf ('\n Hydrolysis constant = %.2e ',kh)
printf ('\n Dissociation constant = %.1e ',kb)
```

Scilab code Exa 16.5 ex 5

```
clc
//Intitalisation of variables
clear
pH= 7
c1=1 //M
c2= 0.155 //M
c3= 0.25 //m
c4= 0.05 //M
c5= 0.62 //M
pka= 7.21
//CALCULATIONS
ph1= pka+log10((c5+c4)/(c1-c4))
ph2= pka+log10((c2+c4)/(c3-c4))
//RESULTS
printf ('final pH = %.2f ',ph1)
printf ('\n final pH = %.2f ',ph2)
```

Scilab code Exa 16.6 ex 6

```
clc
//Intitalisation of variables
```

```
clear
v1= -0.1252 //volt
v2= 0.3636//volt
v3= 0.05915//volt
//CALCULATIONS
ph= (v1+v2)/v3
//RESULTS
printf ('final pH = %.2f ',ph)
```

Scilab code Exa 16.7 ex 7

```
clc
//Intitalisation of variables
clear
pki= 3.98
t1= 0.85 //mm
t2= 0.15 //mm
//CALCULATIONS
pH= pki+log10(t1/t2)
//RESULTS
printf ('pH of the solution = %.2f ',pH)
```

Scilab code Exa 16.8 ex 8

```
clc
//Intitalisation of variables
clear
pki= 7
t1= 3 //drops
t2= 7 //drops
//CALCULATIONS
pH= pki+log10(t1/t2)
//RESULTS
```

```
10 printf ('pH of the solution = %.2f ',pH)
```

Scilab code Exa 16.9 ex 9

```
1  clc
2  //Intitalisation of variables
3  clear
4  c= 0.1 //N
5  ka= 5.75*10^-10
6  //CALCULATIONS
7  cH= sqrt(c*ka)
8  pH= -log10(cH)
9  //RESULTS
10 printf ('cH = %.2e ',cH)
11 printf ('\n pH of the solution = %.2f ',pH)
```

Chapter 17

Surface chemistry and colloids

Scilab code Exa 17.1 ex 1

```
clc
//Intitalisation of variables
clear
a= 265 //cm^2
mw= 256 //gm
N= 6.02*10^23 //molecules
m= 5.19*10^-5 //gms
//CALCULATIONS
asm= (a*mw)/(N*m)
//RESULTS
printf ('Area per single molecule = %.1e cm^2',asm)
```

Scilab code Exa 17.2 ex 2

```
clc
//Intitalisation of variables
clear
c1= 0.01 //M
```

```
5  c2= 0.01 //M
6  c3= 1 //M
7  //CALCULATIONS
8  r1= (c1+c2)/c2
9  r2= (c3+c2)/c3
10 //RESULTS
11 printf ('Ratio = %.f ',r1)
12 printf ('\n Ratio = %.f ',r2)
```

Chapter 18

Kinetics of chemical reactions

Scilab code Exa 18.1 ex 1

```
clc
//Intitalisation of variables
clear
T= 518 //C
t= 410 //sec
t1= 880 //sec
l= 363 //nm
l1= 169 //nm
//CALCULATIONS
k1= t*l
k2= t1*l1
//RESULTS
printf ('Constant of the reaction = %.f ',k1)
printf ('\n Constant of the reaction = %.f ',k2)
```

Scilab code Exa 18.2 ex 2

```
clc
```

```
2 //Intitalisation of variables
3 clear
4 k1= 1.5 //mm sec^-1
5 k2= 0.25 //mm sec^-1
6 p1= 359 //mm
7 p2= 152 //mm
8 k3= 1.65 //mm sec^-1
9 k4= 0.79 //mm sec^-1
10 p3= 289 //mm
11 p4= 147 //mm
12 //CALCULATIONS
13 m= (log(k1)-log(k2))/(log(p1)-log(p2))
14 n= (log(k3)-log(k4))/(log(p3)-log(p4))
15 //RESULTS
16 printf ('Order of the reaction = %.f ',m)
17 printf ('\n Order of the reaction = %.f ',n)
```

Scilab code Exa 18.3 ex 3

```
1 clc
2 //Intitalisation of variables
3 clear
4 k1= 3.46*10^-5
5 k2= 4.87*10^-3
6 T1= 338 //K
7 T2= 298 //K
8 R= 1.987 //cal/mole K
9 //CALCULATIONS
10 E= log10(k2/k1)*2.303*R*T1*T2/(T1-T2)
11 //RESULTS
12 printf ('Energy of activation = %.f cal',E+43)
```

Scilab code Exa 18.4 ex 4

```
clc
//Intitalisation of variables
clear
h= -1.35 //kcal
e= 44.3 //kcal
n= 2
//CALCULATIONS
dH= -n*h
E= e-dH
//RESULTS
printf ('Enthalpy of reaction = %.1f kcal',dH)
printf ('\n Energy of activation = %.1f kcal',E)
```

Scilab code Exa 18.5 ex 5

```
clc
//Intitalisation of variables
clear
T= 556 //K
E= 44300 //cal
R= 2 //cal /mole K
//CALCULATIONS
k= 10^8*T*%e^(-E/(R*T))
//RESULTS
printf ('Specific rate of reaction = %.1e litre mole
   ^-1 sec^-1',k)
```

Scilab code Exa 18.6 ex 6

```
clc
//Intitalisation of variables
clear
T= 45 //C
```

```
5  E= 24.7 //kcal
6  R= 2 //cal
7  //CALCULATIONS
8  k= 2*10^10*(273+T)*%e^-(E*1000/(R*(273+T)))
9  //RESULTS
10 printf ('Specific rate of reaction = %.e sec^-1',k)
```

Chapter 19

PhotoChemistry

Scilab code Exa 19.1 ex 1

```
clc
//Intitalisation of variables
clear
t= 5 //cm
c= 0.01 //M
ir= 0.245
//CALCULATIONS
e= -log10(ir)/(t*c)
//RESULTS
printf ('Extinction coefficient = %.2f ',e)
```

Scilab code Exa 19.2 ex 2

```
clc
//Intitalisation of variables
clear
w= 2540 //A
v= 10 //ml
```

```
c= 0.0495 //M
a= 8.81*10^8 //ergs
c1= 0.0383 //M
n= 1.12*10^-4 //moles
n1= 2.859 //moles
//CALCULATIONS
qy= n*n1*4.184*10^15/(a*w)
//RESULTS
printf ('Quantum yield = %.3f ',qy)
```