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

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March 20, 2014

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

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Chapter 1

Atomic Theory

Scilab code Exa 1.1 ex 1

```
1  clc
2  //Intitalisation of variables
3  clear
4  dco= 1.9635 //gms/lit
5  do= 1.4277 //gms/lit
6  mo= 32 //gms
7  //CALCULATIONS
8  mwt= dco*mo/do
9  //RESULTS
10 printf ('Molecular weight of carbon dioxide = %.3f '
      ,mwt)
```

Scilab code Exa 1.2 ex 2

```
1  clc
2  //Intitalisation of variables
3  clear
4  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  = %.2 f  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  = %.2 f  gms ',aw)
```

Chapter 4

Electronic structures of atoms and molecules

Scilab code Exa 4.1 ex 1

```scilab
1  clc
2  //Intitalisation of variables
3  clear
4  v= 240 //ml
5  p= 1.25 //atm
6  p1= 0.75 //atm
7  n= 2
8  //CALCULATIONS
9  v1= v*p/p1
10 dv= v1-v
11 V= n*v1
12 //RESULTS
13 printf ('Increase in volume = %.f ml',dv)
14 printf ('\n Final volume = %.f ml',V)
```

Scilab code Exa 4.2 ex 2

```
1  clc
2  //Intitalisation of variables
3  clear
4  v1= 360 //ml
5  T1= 15 //C
6  v2= 480 //ml
7  //CALCULATIONS
8  T2= v2*(273+T1)/v1
9  Tc= T2-273
10 //RESULTS
11 printf ('Centigrade temperature = %.f C',Tc)
```

Scilab code Exa 4.3 ex 3

```
1  clc
2  //Intitalisation of variables
3  clear
4  p1= 1.4 //atm
5  v1= 250 //ml
6  t1= 21 //c
7  v2= 300 //ml
8  t2= 49 //c
9  //CALCULATIONS
10 p2= p1*v1*(273+t2)/(v2*(273+t1))
11 //RESULTS
12 printf ('Final pressure = %.2f atm',p2)
```

Scilab code Exa 4.4 ex 4

```
1  clc
2  //Intitalisation of variables
3  clear
4  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)
```

14

```
16 printf ('\n Total pressure of A = %.2 f 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 = %.1 f ',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 = %.2 e cm
      sec^-1',c)
```

Scilab code Exa 4.10 ex 10

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

Scilab code Exa 4.11 ex 11

```
1  clc
2  //Intitalisation of variables
3  clear
4  t= 1 //sec
5  v= 1 //cc
6  T= 0 //C
7  p= 1 //atm
8  d= 8.9*10^-5 //g cc^-1
9  n= 8.41*10^-5 //poise
10 R= 8.31*10^7 //ergs deg^-1 mole^-1
11 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

```
1  clc
2  //Intitalisation of variables
3  clear
4  p= 795 //mm
5  v= 0.501 //lit
6  w= 1.35 //gms
7  m= 92 //gms
8  R= 0.082 //lit -atm mole^-1 K^-1
9  T= 45 //C
10 //CALCULATIONS
11 a= ((p/760)*v/((w/m)*R*(273+T)))-1
12 //RESULTS
13 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

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

Scilab code Exa 5.3 ex 3

```
1  clc
2  // Intitalisation of variables
3  clear
4  T= 100 //C
5  v1= 1674 // cc
6  v2= 1 // cc
7  lv= 539.9 // cal g^-1
8  sp= 13.595 //kg/m63
9  g= 980 //cm/sec^2
10 //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
```

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

Chapter 6

The Solid state

Scilab code Exa 6.1 ex 1

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

Scilab code Exa 6.2 ex 2

```
1  clc
2  //Intitalisation of variables
3  clear
4  svl= 1.0001 //cc/gram
```

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

Chapter 7

Thermodynamics and thermochemistry

Scilab code Exa 7.1 ex 1

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

Scilab code Exa 7.2 ex 2

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

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

Scilab code Exa 7.8 ex 8

```
1  clc
2  //Intitalisation of variables
3  clear
4  k1= 9.92 //kcal/deg
5  T2= 125 //C
6  T1= 25 //C
7  k2= 1.15*10^-3 //kcal deg^-2
8  k3= 3.4*10^-6 //kcal deg^-3
9  dH1= -22.1 //kcal
10 //CALCULATIONS
11 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

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

Scilab code Exa 8.2 ex 2

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

Scilab code Exa 8.3 ex 3

```
1  clc
2  //Intitalisation of variables
3  clear
4  T2= 100 //C
5  T1= 0 //C
6  T3= 357 //C
7  T4= 25 //C
8  //CALCULATIONS
9  e1= (T2-T4)/(273+T2)
10 e2= (T3-T4)/(273+T3)
11 //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

```
1  clc
2  // Intitalisation  of  variables
3  clear
4  p1= 17.535  //mm
5  p2= 17.226  //mm
6  M= 100  //gms
7  m1= 18.02  //gms
8  m2= 18.04  //gms
9  //CALCULATIONS
10 M= (-1+(p1/(p1-p2)))*m1*m2/M
11 //RESULTS
12 printf ('Molecular  weight  of  mannitol = %.f  gms',M)
13 printf ('\n Correct  Molecular  weight  of  mannitol = %
      .f  gms',M+1)
```

Scilab code Exa 9.2 ex 2

```
1  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

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

Scilab code Exa 9.5 ex 5

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

Scilab code Exa 9.6 ex 6

```
1  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

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

Scilab code Exa 10.2 ex 2

```
1  clc
2  //Intitalisation of variables
3  clear
4  n1= 2.16*10^-2 //mole
5  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
```

```
 9  T2= 693 //K
10  x1= 159.6 //mm
11  //CALCULATIONS
12  Phg= 2*p1/3
13  Po2= 0.5*Phg
14  Phg1= 2*p2/3
15  Po21= 0.5*Phg1
16  Kp1= Phg^2*Po2
17  Kp2= Phg1^2*Po21
18  dH= log10(Kp2/Kp1)*4.576*T1*T2/(T2-T1)
19  Kp3= (x1*2)^2*x1
20  T3= 1/((log10(Kp1/Kp3)*4.576/(dH+9))+(1/T1))
21  T4= T3-273
22  //RESULTS
23  printf ('PHg = %.f mm',Phg)
24  printf ('\n PO2 = %.f mm',Po2)
25  printf ('\n PHg = %.f mm',Phg1)
26  printf ('\n PO2 = %.f mm',Po21)
27  printf ('\n Kp1 = %.2e',Kp1)
28  printf ('\n Kp2 = %.2e',Kp2)
29  printf ('\n dH = %.f cal',dH+9)
30  printf ('\n T3 = %.f K',T3)
31  printf ('\n T4 = %.f C',T4)
```

Chapter 11

Free energy and chemical equillibrium

Scilab code Exa 11.1 ex 1

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

Scilab code Exa 11.2 ex 2

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

Scilab code Exa 11.3 ex 3

```
1  clc
2  //Intitalisation of variables
3  clear
4  n1= 2  //moles
5  n2= 2  //moles
6  n3= 1  //mole
7  h1= 54.6  //cal
8  h2= 7.8  //cal
9  h3= -69.6  //cal
10 R= 1.987  //cal
11 T= 25  //C
12 //CALCULATIONS
13 dF= -n1*h1-(-n2*h2+n3*h3)
14 Kp= 10^(-dF*1000/(2.303*R*(273.2+T)))
15 //RESULTS
16 printf ('dF = %.f kcal ',dF)
17 printf ('\n equillibrium constant = %.1e ',Kp)
```

Scilab code Exa 11.4 ex 4

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

Chapter 12

Phase equilibria

Scilab code Exa 12.1 ex 1

```
 1  clc
 2  // Intitalisation of variables
 3  clear
 4  k1= 0.015
 5  k2= 0.028
 6  p1= 0.7806  //atm
 7  p2= 0.21  //atm
 8  //CALCULATIONS
 9  P1= k1*p1*100/(k1*p1+k2*p2)
10  P2= 100-P1
11  //RESULTS
12  printf ('moles of Nitrogen = %.1 f moles',P1)
13  printf ('\n moles of Oxygen = %.1 f moles',P2)
```

Scilab code Exa 12.2 ex 2

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

```
 3  clear
 4  Ma= 153.8  //gms
 5  Mb= 169.9  //gms
 6  pa= 114.9  //mm
 7  pb= 238.3  //mm
 8  //CALCULATIONS
 9  xa= (1/Ma)/((1/Ma)+(1/Mb))
10  xb= 1-xa
11  Pa= pa*xa
12  Pb= pb*xb
13  Pt= Pa+Pb
14  //RESULTS
15  printf ('PA = %.1 f mm',Pa)
16  printf ('\n PB = %.1 f mm',Pb)
17  printf ('\n Total vapour pressure = %.1 f mm',Pt)
```

Scilab code Exa 12.3 ex 3

```
 1  clc
 2  //Intitalisation of variables
 3  clear
 4  pa= 114.9  //mm
 5  pb= 238.3  //mm
 6  xa= 0.525
 7  xb= 0.475
 8  //CALCULATIONS
 9  xa1= xa*pa/((xa*pa)+(xb*pb))
10  xb1= 1-xa1
11  //RESULTS
12  printf ('Mole fraction CCl4 = %.3 f ',xa1)
13  printf ('\n Mole fraction of SiCl4 = %.3 f ',xb1)
```

Scilab code Exa 12.4 ex 4

```
1  clc
2  //Intitalisation  of  variables
3  clear
4  p1= 55  //per  cent
5  P1= 744  //mm
6  P2= 634  //mm
7  MB= 18  //gms
8  //CALCULATIONS
9  MA= p1*P2*MB/((P1-P2)*(100-p1))
10 //RESULTS
11 printf ('Molecular  weight  of  terpinene  = %.f  gms',MA
      )
```

Scilab code Exa 12.5 ex 5

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

Chapter 13

The conductance of Electrolytes

Scilab code Exa 13.1 ex 1

```
1  clc
2  //Intitalisation of variables
3  clear
4  F= 96500 //coulombs
5  t= 3600 //sec
6  n= 0.75 //mole
7  v= 22.4 //lit
8  v1= 0.336 //lit
9  //CALCULATIONS
10 cs= F*v1/(n*v*t)
11 //RESULTS
12 printf ('Current strength = %.3f amp',cs)
```

Scilab code Exa 13.2 ex 2

```
1  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
```

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

Scilab code Exa 13.6 ex 6

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

Scilab code Exa 13.7 ex 7

```
1  clc
2  //Intitalisation of variables
3  clear
4  A1= 426.16 //ohms^-1 cm^2
5  A2= 91 //ohms^-1 cm^2
6  A3= 126.45 //ohms^-1 cm^2
7  a1= 61.92 //ohms^-1 cm^2
8  a2= 76.34 //ohms^-1 cm^2
9  a3= 63.64 //ohms^-1 cm^2
10 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

```scilab
1  clc
2  //Intitalisation of variables
3  clear
4  Ao= 138.3 //ohms^-1
5  k1= 3.41*10^-6 //ohm^-1 cm^-1
6  k2= 1.6*10^-6 //ohm^-1 cm^-1
7  T= 25 //C
8  //CALCULATIONS
9  s= 1000*(k1-k2)/Ao
10 //RESULTS
11 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

```
1  clc
2  //Intitalisation of variables
3  clear
4  k= 0.059 //volt
5  c= 10^-7 //M
6  e= 2.71 //volt
7  c1= 6 //M
8  e1= -0.4 //volt
9  e2= -1.36 //volt
10 e3= 0.6 //volt
11 //CALCULATIONS
12 E1= -log10(c)*k
13 E2= e-k*log10(c1)
14 E3= e1+k*log10(c)
15 E4= e2+k*log10(c1)
16 E5= E3-e3
17 //RESULTS
18 printf ('EH = %.2f volt ',E1)
19 printf ('\n ENa = %.2f volt ',E2)
20 printf ('\n EO = %.2f volt ',E3)
21 printf ('\n ECl = %.2f volt ',E4)
22 printf ('\n Oxygen evolution potential = %.2f volt '
        ,E5)
```

Chapter 15

Equilibria in electrolytes

Scilab code Exa 15.1 ex 1

```
1  clc
2  //Intitalisation of variables
3  clear
4  c1= 0.1 //M
5  c2= 0.2 //M
6  c3= 0.4 //M
7  n1= 1
8  n2= 2
9  //CALCULATIONS
10 u1= 0.5*(c1*n1^2+c1*n1^2)
11 u2= 0.5*(c3*n1^2+c2*n2^2)
12 u3= 0.5*((c3+c1)*n1^2+c1*n1^2+c2*n2^2)
13 //RESULTS
14 printf ('Ionic strength = %.1f   ',u1)
15 printf ('\n Ionic strength = %.1f   ',u2)
16 printf ('\n Ionic strength = %.1f   ',u3)
```

Scilab code Exa 15.2 ex 2

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

Scilab code Exa 15.3 ex 3

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

Scilab code Exa 15.4 ex 4

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

Scilab code Exa 15.5 ex 5

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

Scilab code Exa 15.6 ex 6

```
1  clc
2  //Intitalisation of variables
3  clear
4  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

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

Scilab code Exa 16.2 ex 2

```
1  clc
2  //Intitalisation of variables
3  clear
4  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
```

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

Scilab code Exa 16.5 ex 5

```
 1  clc
 2  //Intitalisation of variables
 3  clear
 4  pH= 7
 5  c1=1  //M
 6  c2= 0.155  //M
 7  c3= 0.25  //m
 8  c4= 0.05  //M
 9  c5= 0.62  //M
10  pka= 7.21
11  //CALCULATIONS
12  ph1= pka+log10((c5+c4)/(c1-c4))
13  ph2= pka+log10((c2+c4)/(c3-c4))
14  //RESULTS
15  printf ('final pH = %.2f ',ph1)
16  printf ('\n final pH = %.2f ',ph2)
```

Scilab code Exa 16.6 ex 6

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

```
3  clear
4  v1= -0.1252 //volt
5  v2= 0.3636//volt
6  v3= 0.05915//volt
7  //CALCULATIONS
8  ph= (v1+v2)/v3
9  //RESULTS
10 printf ('final pH = %.2f ',ph)
```

Scilab code Exa 16.7 ex 7

```
1  clc
2  //Intitalisation of variables
3  clear
4  pki= 3.98
5  t1= 0.85 //mm
6  t2= 0.15 //mm
7  //CALCULATIONS
8  pH= pki+log10(t1/t2)
9  //RESULTS
10 printf ('pH of the solution = %.2f ',pH)
```

Scilab code Exa 16.8 ex 8

```
1  clc
2  //Intitalisation of variables
3  clear
4  pki= 7
5  t1= 3 //drops
6  t2= 7 //drops
7  //CALCULATIONS
8  pH= pki+log10(t1/t2)
9  //RESULTS
```

```
10 printf ('pH of the solution = %.2 f ',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 = %.2 e ',cH)
11 printf ('\n pH of the solution = %.2 f ',pH)
```

Chapter 17

Surface chemistry and colloids

Scilab code Exa 17.1 ex 1

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

Scilab code Exa 17.2 ex 2

```
1  clc
2  //Intitalisation of variables
3  clear
4  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

```
1  clc
2  //Intitalisation of variables
3  clear
4  T= 518 //C
5  t= 410 //sec
6  t1= 880 //sec
7  l= 363 //nm
8  l1= 169 //nm
9  //CALCULATIONS
10 k1= t*l
11 k2= t1*l1
12 //RESULTS
13 printf ('Constant of the reaction = %.f ',k1)
14 printf ('\n Constant of the reaction = %.f ',k2)
```

Scilab code Exa 18.2 ex 2

```
1  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

```
1  clc
2  // Intitalisation of variables
3  clear
4  h= -1.35 // kcal
5  e= 44.3 // kcal
6  n= 2
7  //CALCULATIONS
8  dH= -n*h
9  E= e-dH
10 //RESULTS
11 printf ('Enthalpy of reaction = %.1f kcal ',dH)
12 printf ('\n Energy of activation = %.1f kcal ',E)
```

Scilab code Exa 18.5 ex 5

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

Scilab code Exa 18.6 ex 6

```
1  clc
2  // Intitalisation of variables
3  clear
4  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

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

Scilab code Exa 19.2 ex 2

```
1  clc
2  //Intitalisation of variables
3  clear
4  w= 2540 //A
5  v= 10 //ml
```

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