Scilab Textbook Companion for Quantum Physics Of Atoms, Molecules, Solids, Nuclei And Particles by Eisberg And R. Resnick[1]

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Book Description

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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

Thermal Radiation and Plancks Postulate

Scilab code Exa 1.1 Surface temperature calculation

```
//Example 1.1, page 24
clear
//For sun
sigma=5.67*10^-8//w/m^2-k^4
T=5700//in K
ST_sun=sigma*T^4
printf("\n Surface temperature of sun is %e W/m^2.",
   ST_sun)
//For north star
T=8300//in K
ST_Northstar=sigma*T^4
printf("\n Surface temperature of sun is %e W/m^2.",
   ST_Northstar)
```

Scilab code Exa 1.6 Continious or dis continious energy

```
//Example 1.6, apge 39
clc
g=9.8//in m/s^2, constant
l=.1//in m
m=0.01//in kg
h=6.63*10^-34//Joule-sec
theta=0.1//in radians
v=(1/(2*%pi)*sqrt(g/l))
printf("\n Oscillation frequency of pendulam %f per sec.",v)
E=m*g*l*(1-cos(theta))
printf("\n Energy of pendulum at its maximum potential %e Joule.",E)
Delta_e=h*v
printf("\n Delta E %e Joule",Delta_e)
```

Chapter 2

Photons particle like properties of radiation

Scilab code Exa 2.1 Time to absorb energy

```
//Example 2.1, page 47
clc
P=1//power in j/s
r=10^-10//Radius in m^2
R=(P*%pi*r^2)/(4*%pi)//Rate at which energy falls in J/sec
R_e=3.4*10^-19//in Joule, rate at energy removed
t=R_e/R
printf("\n Time required for energy to clear is %e sec",t)
```

Scilab code Exa 2.2 Work function for sodium

```
//Example 2.2, page 49
clc
h=6.63*10^-34//Joule-sec
```

```
vo=5.6*10^14
w=h*vo
printf("\npower is %e per sec",w)
ev=(1/(1.6*10^-19))
wo=w*ev
printf("\nEnergy is %f ev",wo)
```

Scilab code Exa 2.3 Photons striking metal plate

```
//Example 2.3, Page no 50
p=1//j/s
r=1//radius in m
h=6.63*10^-34//Joule-sec
c=3*10^8//m/sec
lambda=5.89*10^-7//m
R=p/(4*%pi*r^2)
E=(h*c)/lambda
Rate_R=R*(1/E)
printf("\nRate at which photons strike unit area of
    place %e photons/m^2-sec",Rate_R)
```

Scilab code Exa 2.4 X ray beam

```
//Example 2.4, page 57
clc
disp('Part a')
h=6.63*10^-34//Joule-sec
c=3*10^8//m/sec
m_o=9.11*10^-31//in kg

delta_h=(h*(1-cosd(90)))/(m_o*c)
printf("\n Compton shift is %e m",delta_h)
disp('Part b')
```

```
delta1=1*10^-10
K=(h*c*delta_h)/(delta1*(delta1+delta_h))
printf("\n X-ray beam is  %e Joule",K)
delta2=1.88*10^-12
K=(h*c*delta_h)/(delta2*(delta2+delta_h))
printf("\n X-ray beam is  %e Joule",K)
disp('Part c')
E1=(h*c)/delta1
E1_ev=(6.241509*10^18)*E1
printf("\n X-ray energy is  %f ev",E1_ev)
E2=(h*c)/delta2
E2_ev=(6.241509*10^18)*E2
printf("\n X-ray energy is  %f ev",E2_ev)
Per1=(100*.295*10^3)/E1_ev
Per2=(100*378*10^3)/E2_ev
printf("\n Energy lost in percentage  %f ",Per1)
printf("\n Energy lost in percentage  %f ",Per2)
```

Scilab code Exa 2.5 Determine plancks constant

```
//Example2.5, page 61
clc
e=1.6*10^-19//in coul
v=4*10^4//in V
lambda=3*10^-11//in m
c=3*10^8//m/sec
h=(e*v*lambda)/c
printf("\n Plancks constant is %e Joule-sec",h)
```

Scilab code Exa 2.6 Energy and wavelength

```
//example 2.6, page 62
clc
```

```
e=1.6*10^-19//in coul
B=2*10^-1//weber/m2
r=2.5*10^-2//in m
p=e*B*r
printf("\n Momentum of electron %e Kg-m/sec",p)
x=1.5//in Mev, ie c^2*p^2
y=.51//in Mev
E_minus=sqrt(x^2+y^2)
E=2*E_minus//h*v
h=6.63*10^-34//Joule-sec
c=3*10^8//m/sec
lambda=(h*c)/(10^6*E*1.6*10^-19)
printf("\n Photons wavelength is %e m",lambda)
```

Chapter 3

De Broglies postulate wave like behaviour of particles

Scilab code Exa 3.1 Find de broglie wavelength

```
//Example 3.1, page 74
clc
m=1//in kg
h=6.63*10^-34//Joule-sec
v=10//in m/sec
lambda=h/(m*v)
disp('part a')
printf("\n De broglie wavelength for v=10m/sec %e m"
    ,lambda)
disp('part b')
//For KE=100ev
m=9.1*10^-31
K=100*1.6*10^-19//in Joules
lambda=h/sqrt(2*m*K)
printf("\n De broglie wavelength is %e m",lambda)
```

Scilab code Exa 3.2 Mass of Helium and wavelength

```
//Example 3.2, Page 80
clc
h=6.63*10^-34//Joule-sec
v=1.635*10^3//m/s
M=4*10^-3//in kg/mole
No=6.02*10^23//atom/mole
m=M/No
printf("\n Mass of Helium atom is %e kg",m)
lambda=h/(m*v)
printf("\n De broglie wavelength is %e m",lambda)
```

Scilab code Exa 3.3 Speed of the bullet

```
//Example 3.3, Page 87
clc
//For electron
m1=9.1*10^-31//in kg
v=300//in m/s
h=6.6*10^-34//in joule-sec
p1=m1*v//delta v
delta_p1=.0001*p1//m*delata_v in kg-m/sec
delta_x1=(h)/(4*%pi*delta_p1)
printf("\n Position of electron %e  m",delta_x1)

//For bullet
m2=0.05//in kg
p2=m2*v
delta_p2=0.0001*p2//in kg-m/s
delta_x2=(h)/(4*%pi*delta_p2)
printf("\n Position of bullet %e  m",delta_x2)
```

Scilab code Exa 3.5 Fractional width and uncertainity

```
//Example 3.5, page no 94
clc
disp('part b')
lambda=5890*10^-8//in cm
c=3*10^10//in cm/s
v=c/lambda
del_v=8*10^6//per s
x=del_v/v
h=4.14*10^-15//in ev-sec
printf("\n Fractional width of either line(del_v/v)
   %e ",x)
//Calculate uncertainty
disp('part c')
del_t=10^-8
del_e=(h)/(4*%pi*del_t)
printf("\n Uncertainty is %e ev ",del_e)
```

Chapter 4

Bohrs Model of the Atom

Scilab code Exa 4.1 Calculating wavelength

```
//Example 4.1, Page 105
clc
disp('Part b')
rho=9*10^9//in nt-m2/coul2
e=1.6*10^-19//coul
r=1*10^-10//in m
k=(rho*e^2)/(r^3)//nt/m
m=9.11*10^-31//in kg
c=3*10^8//in m/s
v=(1/(2*%pi))*sqrt(k/m)
lambda=c/v
printf("\n The wavelength is %e m ",lambda)
```

Scilab code Exa 4.2 Average deflection

```
//Example 4.2, page 107
clc
disp('Part a')
```

```
N=10^4//in rad, Number of atoms tarversed
theta=(2*10^-2)/sqrt(N)
printf("\n Average deflection %e rad ",theta)
```

Scilab code Exa 4.6 Binding energy of hydrogen atom

```
//Example 4.6, Page 120
clc
rho=9*10^9//in nt-m2/coul2
m=9.11*10^-31//in kg
e=1.6*10^-19//coul
h=1.05*10^-34//in j-sec
E=-(rho*m*e^4)/(2*h^2)
printf("\n Binding energy is %e Joule ",E)
//Answer given in the book is wrong
```

Scilab code Exa 4.9 Muon nucleus seperation

```
//Example 4.9, page 124
clc
disp('Part a')
mu=207//207*me
M=1836//183*me
u=(mu*M)/(mu+M)
D=(1/u)*5.3*10^-11
printf("\nMuon nucleus seperation is  %e m ",D)
disp('Part b')
E=-u*13.6
printf("\n Binding energy is %f ev ",E)
disp('Part c')
R=109737//in cm
lambda=(1/u)*(1/0.75)*(1/R)
printf("\n Wavelength is %e cm ",lambda)
```

Scilab code Exa 4.10 Double nucleus mass effect

```
//Example  4.10 , Page 125
clc
//For Hydrogen atom
R_o=109737//in cm
m=1
M=1836
RH=(R_o)/(1+(m/M))
printf("\n Spectrum line for Hydrogen occur at %f /
   cm ",RH)
//For Deuterium atom
R_o=109737//in cm
m=1
M=2*1836
RD=(R_o)/(1+(m/M))
printf("\n Spectrum line for Deuterium occur at %f /
   cm ",RD)
```

Chapter 6

Solutions of time independent schroedinge equations

Scilab code Exa 6.1 Kinetic energy and penetration distance

```
//Example 6.1, Page 208
clc
m=4*10^-14//in kg
v=10^-2//in m/s
KE=(0.5*m*v^2)
h=10^-34
printf("\n Kinetic energy(Vo-E) at %e Joule",KE)
delta_x=(h)/sqrt(2*m*KE)
printf("\n Value of penetration distance is  %e m ",
   delta_x)
```

Scilab code Exa 6.2 Penetration distance

```
//Example 6.2, page 210
clc
//KE=4ev, convert to joule
```

```
KE=4*1.6*10^-19//in j
m=9*10^-31//in kg
h=10^-34//in j-s
delta_x=(h)/sqrt(2*m*KE)
printf("\n Value of penetration distance is %e m ",
   delta_x)
```

Scilab code Exa 6.3 Probablity of neutron

```
//Example 6.3, page 216
clc
v=50//in Mev
E=55//in Mev
x=sqrt(1-(v/E))
//disp(x)
R=((1-x)/(1+x))^2
printf("\n Probablity of neutron will be reflected
   is %f ",R)
```

Scilab code Exa 6.4 Calculation of number

```
//Example 6.4, page 220
clc
m=9*10^-31//in kg
h=10^-34//in j-s
V=10//in ev
a=1.8*10^-10//in m
//convert v to joule
Vo=V*1.6*10^-19//in Joule
N=(2*m*Vo*a^2)/(h^2)
printf("\n Numbers given is %d ",N)
```

Scilab code Exa 6.6 Value of energy

```
//Example 6.6, page 237
clc
h=10^-34//in j-s
m=10^-30//in kg
a=10^-14//in m
c=3*10^8//in m/s
E=((%pi*h)^2)/(2*m*a*a)
printf("\n Energy is %e  J ",E)
//convert to ev
e=E/(1.6*10^-19)
printf("\n Energy is %e  ev ",e)
//Answer difference is due to round off
E1=(%pi*c*h)/a
printf("\n Zero level Energy is %e  J ",E1)
e1=E1/(1.6*10^-19)
printf("\n Zero level Energy is %e  ev ",e1)
//Answer difference is due to round off
//when A=100
A=100
r=10^-14//in m
x=10^-10//in coul2/nt-m2
ec=1.6*10^-19//in c
Q=(-(A*ec*ec)/(x*r))*(1/ec)
printf("\n Typical value Energy is %e  ev ",Q)
```

Chapter 8

Magnetic dipoles moments spin and transition rates

Scilab code Exa 8.1 Energy supplied

```
//Example 8.1, page 287
clc
u=0.927*10^-23//amp-m2
B=1//in J/amp-m2
E=2*u*B
printf("\n Energy supplied to the dipole  is %e  J "
   ,E)
```

Scilab code Exa 8.2 Transverse deflection

```
//Example 8.2, page 293
//From previous derivation of formula
clc
delb_by_delz=10//tesla/m
u=0.927*10^-23//amp-m2
x=1///in m
```

```
k=1.38*10^-23//j/k
T=400//in K
Z=(delb_by_delz*u*x^2)/(8*k*T)
printf("\n Transverse deflection that occur  is + %e
    m or - %e m ",Z,Z)
```

Scilab code Exa 8.3 Energy deflection

```
//Example 8.3, page 298
clc
m=9*10^-31//in kg
e=1.6*10^-19//in coul
c=3*10^8//in m/s2
four_pi_epsilon=1.1*10^-34//in j-sec
constant=9*10^9//nt-n2/coul2
delta_E=(constant^4*m*e^8)/(54*c*c*(four_pi_epsilon)
   ^4)
printf("\n The energy deflection is %e Joule",
   delta_E)
//Answer given in the book is wrong
```

Scilab code Exa 8.4 Deflection

```
//Example 8.4, page  299
clc
u_s=10^-23//amp-m2
u_b=10^-23//amp-m2
B=u_s/u_b
printf("\n The deflection is  %d  Tesla ",B)
```

Chapter 9

Multi electron atoms ground satate and xray excitation

Scilab code Exa 9.5 Electric field

```
//example 9.5, page 343
clc
Z=[16 8 3]
//Argon numbers

for n=1:1:3
E=(-((Z(n))/n)**2)*13.6
printf("\n The electric field for n=%d is %f ev",n
    , E)
disp(E)
end
//Answer differnce is because of round off
```

Scilab code Exa 9.7 ionization energy

```
//Example 9.7, page 355
```

```
clc
Z=92
n=2
E=((Z/n)**2)*13.6//in ev
printf("\n The ionization energy is  %e  ev",E)
//Answer difference is because of round off
```

Scilab code Exa 9.8 Calculating wavelength

```
//Example 9.8, page 358
clc
//Energy of K shell
z=26
k=2
E_k=13.6*(z-k)^2//in ev
v=7.8*10^3//in V
//for L shell
l=10
E_l=13.6*(z-l)^2//in ev
h=E_k-E_l
R_m=1.1*10^7
x=R_m*(z-2)^2//x=1/lamda
lambda=1/x
printf("\n The wavelength is  %e  m",lambda)
```

Scilab code Exa 9.9 Energy of K shell

```
//example 9.9, page 360
//Energy of K shell
clc
z=82
k=2
E_k=13.6*(z-k)^2//in ev
```

```
printf("\n The energy of K shell is  %e  ev",E_k)
```

Chapter 10

Multi electron atoms optical excitations

Scilab code Exa 10.1 Calculating wavelength

```
//Example 10.1, page 370
clc
E3p=-3//in ev
E3s=-5.1//in ev
E=E3p-E3s
E_Joule=E*1.6*10^-19//in Joule
h=6.6*10^-34//in J-s
c=3*10^8//in m/s
disp('Part a')
lambda=(h*c)/E_Joule
printf("\n The wavelength is %e m",lambda)
//Part b
disp('Part b')
d_lambda=(h*c*E_Joule)/(E_Joule)^2
printf("\n The magnitude of seperation is %e m",
    d_lambda)
//Answer given in book for part b is wrong
```

Scilab code Exa 10.5 Displace energy

```
//Example 10.5, page 386
clc
a=1*(1+1)
x=a+a-a
y=2*a
g=1+(x/y)
u=9.3*10^-24//amp-m2
B=1/10//in Tesla
delta_E=u*B*g
printf("\n The displace energy is  %e  ev",delta_E)
```

Scilab code Exa 10.6 Magnetic energy

```
//Example 10.6, page 387
clc
h=6.6*10^-34//in J-s
v=1*10^10//per sec
ub=9.3*10^-24//in amp-m2
B=(h*v)/(2*ub)
printf("\n The Magentic energy is  %e  Tesla",B)
```

Chapter 11

Quantum statistics

Scilab code Exa 11.3 Boltzan factor

```
//Example 11.3, page 410
clc
h=6.6*10^-34//in J-s
v=1*10^7//per sec
K=1.4*10^-23//in J-K
T=300//in K
n=exp(-((h*v)/(K*T)))
printf("\n The Boltzan factor is  %e  Tesla",1-n)
```

Scilab code Exa 11.5 Fermi energy

```
//Example 11.3, page 424
clc
disp('Part a')
A=108//in g/mole
M=10.5//in g/cm3
D=6.02*10^23//in atom/mole
n=(D*M)/A
```

```
h=6.6*10^-34
printf("\n The fermi energy is  %e electron/cm^3",n)
m=9.1*10^-31//in kg
n=5.9*10^28//per m^2
x=((3*n)/(%pi))^(2/3)
Ef=(h^2/(8*m))*x
printf("\n The energy is  %e J",Ef)
disp('part b')
K=1.38*10^-23//in J-K
T=300//in K
z=(n*h^3)/(2*%pi*m*K*T)^(3/2)
printf("\n The degeneracy term is  %e ",z)
//Anser difference is because of round off
```

Chapter 12

Molecules

Scilab code Exa 12.1 Energy calculation

```
//Example 12.1, page 435
clc
c=9*10^9
cm=1.6*10^-19
d=2.4*10^-10//in m
v=(c*cm*cm)/d
e=v/(1.6*10^-19)//in J
printf("\n The energy is  %e  ev",e)
```

Scilab code Exa 12.3 Calculation of energy and temperature

```
//Example 12.3, page 445
clc
h=6.63*10^-34//in J-s
I=(2*%pi)^2*2.66*10^-47//in kg-m2
m_H=1/(6.02*10^26)//in kg
E=(h^2)/I
printf("\n The energy is  %e  J",E)
```

```
s=.59*10^-19//in J
k=1.38*10^-23//in j/k
T=(s)/k
printf("\n The temperature is  %f  K",T)
//Answer diffrence is because of round off
```

Chapter 13

Solids Conductors and semiconductors

Scilab code Exa 13.1 Electron per unit volume

```
//Example 13.1, Page no 471
clc
m=9.11*10^-31//in kg
h=6.63*10^-34//in j-s
ef=4.72*1.60*10^-19//in J
n=%pi*(((8*m)/h**2)^(3/2))*((ef**(3/2))/3)
printf("\n The number of electron per unit volume in
    lithium is  %e  /m^3",n)
```

Scilab code Exa 13.3 Angle

```
//Example 13.3, page 483
clc
m=9.11*10^-31//in kg
h=6.63*10^-34//in j-s
c=3*10^8//m/s
```

```
ef=4.72*1.60*10^-19//in J
pf=sqrt(2*m*ef)
tf=pf/(m*c)
printf("\n The angle is  %e  rad",tf)
```

Chapter 14

Solids super conductors and magnetic properties

Scilab code Exa 14.1 Calculating wavelength and gap energy

```
//Example 14.1, page 507
clc
disp('Part a')
k=1.4*10^-23//in J/K
Te=4.2//in K
eg=3*k*Te
printf("\n The gap energy is  %e  J",eg)
h=6.63*10^-34//in j-s
c=3*10^8//m/s
disp('Part b')
lambda=(h*c)/eg

printf("\n The wavelength is  %e  m",lambda)
```

Scilab code Exa 14.3 Unpaired electrons

```
//Example 14.3, Page 514
clc
u=9.3*10^-24//in Tesla
B=1//in Tesla
Eb=u*B*6.24150934*10^18
T=300//in K
k=8.6*10^-5//ev/k
x=k*T
s=(Eb/x)*100
disp('Part a')
printf("\n The percentage is  %f",s)
disp('Part b')
n=2.0*10^28///m3
k=1.38*10^-23//in J/k
uo=4*%pi*10^-7//T-m/amp
con=(uo*n*u)/(k*T)
printf("\n The number of unpaired electrons is  %e",
    con)
```

Scilab code Exa 14.4 Energy and wavelength

```
//Example 14.4, Page 516
clc
uo=4*%pi*10^-7//T-m/amp
u=2.2*9.3*10^-24//in Tesla
x=3*10^-10//in m
E=(uo*u*u)/(2*%pi*x**3)
printf("\n The Energy required  is  %e Joule",E)
k=1.38*10^-23//in J/k
T=E/k
printf("\n The temperature  is  %f K",T)
```

Chapter 15

Nuclear Models

Scilab code Exa 15.2 Calculating wavelength and angle

```
//Example 15.2, Page 533
clc;
c=3*10^8//m/s
k=500//Mev
p=(k)/(c*6.2*10^12)
h=6.63*10^-34//in j-s
lambda=h/p
angle=0.53//in rad
r=lambda/angle
printf("\n The wavelength is %e m",lambda)
printf("\n The angle is %e m",r)
```

Scilab code Exa 15.4 Atomic mass

```
//Example 15.4, Page 540
clc
kb=4.44//in Mev
ka=7.70//in Mev
```

```
mb=1
mB=17
ma=4
Q=(kb*(1+(mb/mB)))-(ka*(1-(ma/mB)))
disp('Part a')
printf("\n The value of Q is %f  Mev",Q)
c=3*10^8//m/s
m=Q/(931.5)
printf("\n The atomic mass of Q is %e  u",m)
```

Scilab code Exa 15.5 Binding energy

```
//Example 15.5, Page 541
clc
M_He=4.0026033//*u, Mass of helium
M1H1=1.00782525//*u, electron mass
Mon1=1.0086654//*u, neutron mass
Mass=(2*M1H1)+(2*Mon1)
delta_M=(Mass)-M_He
printf("\n The binding energy of helium is  %f  *u",
   delta_M)
```

Scilab code Exa 15.7 Blank

```
//Example 15.7, page 547
```

Scilab code Exa 15.8 Density and potential

```
//Example 15.8, page 550
clc
```

```
N=0.60
rho=(N)/((4/3))
printf("\n The density is  %f  /pi*a^3",rho)
h=6.63*10^-34//in j-s
a=1.1//F
M=1
ef=43//in Mev
En=7//in Mev
Vo=ef+En
printf("\n The depth of the net nuclear potential
    acting on neutron \n is %d Mev", Vo)
```

Chapter 16

Nuclear decay and nuclear reactions

Scilab code Exa 16.1 Total energy

```
//Example 16.1, page 575
clc
r=(4**(1/3)+208**(1/3))*1.07
printf("\n The sum of radii is %f F",r)
e=1.60*10^-19//in coul
z=82
x=1.1*10^-10//coul2/nt-m2
Vo=(2*z*e*e)/(x*r*10^-15)
printf("\n The total energy is %e J",Vo)
```

Scilab code Exa 16.2 Elapsed time

```
//Example 6.2, Page 579
clc
x=log(exp(.827))
t=(log(143))/x
```

```
printf("\n The elapsed time is  %f *10^9  year",t)
```

Scilab code Exa 16.4 Life time

```
//Example 16.4, Page 589
clc
// Using formula logb(m)=n
//n=b^n
F=10^(-5.7)
Y=12.3 //yr
d=365//day/yr
h=24//hr/day
m=60//min/hr
s=60//sec/min
T=(Y*d*h*m*s)/0.693
printf("\n The life time is  %e  s",T)
```

Scilab code Exa 16.5 Value of beta

```
//Example 16.5, Page 591
clc
h=1.05*10^-34//j-s
F=1.2
T=10^3//in s
m=.91*10^-30//in kg
c=3*10^8//in m/s
M=1
beta_square=(2*%pi*%pi*%pi*(h^7))/(F*T*(m^5)*(c^4))
beta=sqrt(beta_square)
printf("\n The value of Beta is %e  J^2*m^6",beta)
```

Scilab code Exa 16.7 Value of delta and tou

```
//Example 16.7, Page no 603
clc
E=0.129//in Mev
x=931//uc^2
Del_E=(E)**2/(2*x*191)
printf("\n The value of delta E is %e  ev",Del_E
   *10**6)
h=6.6*10^-16//ev-sec
T=1.4*10^-10//sec
Tou=h/T
printf("\n The value of Tou is %e  ev",Tou)
```

Scilab code Exa 16.9 Neutron produced

```
//Example 16.9, page 607
clc
Z=0+1+4
A=1+9-1
printf("\n The value of z is %d",Z)
printf("\n The value of A is %d",A)
ka=50
kb=48.1
mB=1
ma=1/9
mb=1/9
x=1/9//ma/mB
y=1/9//mb/mB
part1=kb*(1+x)
part2=ka*(1-y)
part3=(2*sqrt(ka*kb*ma*mb))
Q=part1-part2-part3
printf("\n The value of Q is %f Mev",Q)
sq_kb_plus=(1.36+sqrt(1.36**2+(4*1.11*42.5)))
```

```
/(2*1.11)
sq_kb_minus=(1.36-sqrt(1.36**2+(4*1.11*42.5)))/(2*1.11)
kb_plus=(sq_kb_plus)**2
kb_minus=(sq_kb_minus)**2
printf("\n The maximum neutron produced at angle 30 degree is %f Mev",kb_plus)
```

Scilab code Exa 16.10 Events detected

```
//Example 16.8, page 615
clc
n=(1/10)/(54*1.66*10^-27)
d_ohm=10^-5/(10^-1)**2
d_zigma=(1.3*10^-3)*10^-31//m2/nucleus
P=d_zigma*n
//disp(P)
I=(10^-7)/(1.6*10^-19)
//disp(I)
dN=I*P
printf("\n The number of events detected per sec is s %d",dN)
//The answer differnce is because of round off
```

Scilab code Exa 16.11 Free electron

```
//Example 16.11, page 624
clc
E=200*1.6*10^-13//j/neutron
E=10^-11//Rounding off
p=E/(10^-3)
P=10^8//in watt
N=P/p
```

```
printf("\n The number of free electron present is %e
   ",N)
```

Chapter 17

Introduction to elementary particles

Scilab code Exa 17.1 Kinetic energy

```
//Example 17.1, Page 643
clc
h=1.05*10^-34//j-s
M=1.7*10^-27//in kg
r=2*10^-15//in m
K=(h**2)/(M*r*r)
s=K* 6.24150647996E+12//converting to Mev
K_total_cm=2*s
k_incident=2*K_total_cm
printf("\n The kinetic energy of incident nucleon is
    %d Mev",k_incident)
```

Scilab code Exa 17.3 value of pi

```
//Example 17.3, page 653
clc
```

```
h=1*10^-34//j-s
r=2*10^-15//m
c=3*10^8//m/s
m_pi=h/(r*c)
printf("The value of m pi is %e kg", m_pi)
//Answer difference is because of round off
```

Scilab code Exa 17.5 Value of K

```
//Example 17.5, page no 664
clc;
Tz=(1-1)/2
//For K+
Q=1
B=0
S=1
Tz=1-0.5
printf("The value of Tz for K+ is %f \n",Tz)

//For K-
Q=-1
B=0
S=-1
Tz=-1+0.5
printf("The value of Tz for K- is %f\n",Tz)


//For Ko
Q=0
B=0
S=1
Tz=-0-0.5
printf("The value of Tz for Ko is %f \n",Tz)


```

```
//For Ko_dash
Tz=0+0.5
printf("The value of Tz for Ko- is %f \n",Tz)
```

Chapter 18

More elementary particles

Scilab code Exa 18.2 Variable values

```
//Example 18.2, Page 694
clc
Q=(2/3)-(1/3)-(1/3)
B=(1/3)+(1/3)+(1/3)
S=0+0-1
T=(1/2)+(1/2)+0
Tz=(1/2)-(1/2)+0
printf("The value of Q is %f \n",Q)
printf("The value of B is %f \n",B)
printf("The value of S is %f \n",S)
printf("The value of T is %f \n",T)
printf("The value of Tz is %f \n",Tz)
```