Scilab Textbook Companion for Schaum's Outline Of Physical Science by A. Beiser[1]

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Book Description

Title: Schaum's Outline Of Physical Science

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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

Physical Quantities

Scilab code Exa 1.1 1

```
clc;
disp("2*10^1");
disp("3.043*10^3");
disp("8.7*10^6");
disp("2.2*10^-1");
disp("3.5*10^-1");
```

Scilab code Exa 1.2 2

```
clc;
disp(6*10^2+5*10^4);
disp(2*10^-2+3*10^-3);
disp(7+2*10^-2);
disp(6*10^4-4*10^2);
disp(3*10^-2-5*10-3);
disp(7*10^-5-2*10^-4);
disp(6.23*10^-3-6.28*10^-3);
```

Scilab code Exa 1.3 3

```
clc;
disp(10^5*10^-2);
disp(10^4/10^-3);
disp(10^3/10^6);
disp((10^5*10^-7)/10^2);
```

Scilab code Exa 1.4 4

```
clc;
disp((460*0.00003*100000)/(9000*0.0062));
```

Scilab code Exa 1.5 5

```
clc;
disp(10^2*10^4);
disp(10^-15);
disp(10^12);
disp((3*10^3)^3);
disp((4*10^-5)^3);
disp((2*10^-2)^-4);
```

Scilab code Exa 1.6 6

```
clc;
disp(sqrt(10^6));
```

```
3 disp(sqrt(5*10^4));
4 disp(sqrt(3*10^5));
5 disp(sqrt(0.000025));
```

Scilab code Exa 1.7 7

```
1 clc;
2 disp(10^3);
3 disp(10^(8/3));
4 disp((3.8*10^19)^(1/3));
5 disp((2.7*10^-5)^(1/3));
```

Scilab code Exa 1.8 8

```
1 clc;
2 disp(1440*0.621,"Distance in miles");      //
    displaying result
```

Scilab code Exa 1.9 9

```
1 clc;
2 disp(74*2.54,"Height in cm = ");      //displaying
    result
```

Scilab code Exa 1.10 10

```
clc;
disp(1*3.28*3.28,"In ft square");    //displaying
    result
```

Scilab code Exa 1.11 11

```
clc;
disp((60*5280)/3600,"Velocity in ft/sec = ");      //
    displaying result
```

Chapter 2

Motion in a straight line

Scilab code Exa 2.1 1

```
1 clc;
2 disp(9/(3/4),"Velocity in min/hr = ");     //
    displaying result
```

Scilab code Exa 2.2 2

```
1 clc;
2 disp(1100*3,"Distance in ft = ");     //using s=v*t
```

Scilab code Exa 2.3 3

```
1 clc;
2 disp((1.5*10^11)/(3*10^8),"Time in second = ");
        //using t=s/v
```

Scilab code Exa 2.4 4

```
clc;
disp(270/4.5,"Velocity in min/hr = ");     //using v=
    s/t
disp(60*7,"Distance in mile = ");     //using v=s/t
disp(300/60,"Time in hr = ");      //using t=s/v
```

Scilab code Exa 2.5 5

```
clc;
s=1000;       //distance in mile
v=400+120;      //velocity in mile/hr
disp(s/v,"Time in hr = ");     //using t=s/v
```

Scilab code Exa 2.6 6

```
clc;
v1=100;           //speed in km/hr
v2=60;          //speed in km/hr
v3=80;         //speed in km/hr
t1=2;          //time in hr
t2=2;          //time in hr
t3=1;         //time in hr
disp(((v1*t1)+(v2*t2)+(v3*t3))/(t1+t2+t3),"Velocity
    in km/hr = ");     //displaying result
```

Scilab code Exa 2.7 7

```
clc;
v=40;           //velocity in ft/sec
t=10;           //time in sec
a=v/t;
disp(a,"Accelaration in ft/sec square = "); //using
    a=v/t
disp(a*t,"Velocity in ft/sec = ");       //using v=a*
    t
```

Scilab code Exa 2.8 8

```
clc;
v=30;     //velocity in min/hr
v0=20;    //velocity in min/hr
t=1.5;     //time in sec
a=((v-v0)/t);      //calculating acc.
t1=(36-30)/a;         //calculating time
disp(a,"Accelaration in (min/h)/sec = ");  //
    displaying result
disp(t1,"Time in second = ");      //displaying
    result
```

Scilab code Exa 2.9 9

```
clc;
v=24;       //velocity in m/sec
a=8;        //acc. in m/sec square
t=v/a;      //using t=v/a
disp(t,"Time in sec = "); //displaying result
s=(1/2)*(a*t*t);       //kinematical equation
```

```
7 disp(s,"Distance in metre = ");       //displaying
    result
```

Scilab code Exa 2.10 10

```
1 clc;
2 v=30;         //velocity in m/sec
3 a=6;          //acc. in m/sec square
4 t=v/a;        //using t=v/a
5 disp(t,"Time in sec = "); //displaying result
6 s=(1/2)*(a*t*t);       //kinematical equation
7 disp(s,"Distance in metre = ");       //displaying
    result
```

Scilab code Exa 2.11 11

```
1 clc;
2 disp(sqrt(2*5*600),"Velocity in ft/sec = "); //
    displaying result
```

Scilab code Exa 2.12 12

```
1 clc;
2 v=50;          //velocity in m/sec
3 s=500;         //distance in m
4 disp((v*v)/(2*s),"Acc. in m/sec square = ");      //
    displaying result
```

Scilab code Exa 2.13 13

```
clc;
v=15;      //velocity in m/sec
v0=30;     //velocity in m/sec
a=-2;      //acc. in m/sec square
s=((v*v)-(v0*v0))/(2*a);      //kinematical equation
disp(s,"Distance in metre = ");       //displaying
   result
v=0;
s=(v*v)-(v0*v0)/(2*a);
disp(s,"Distance in metre = ");       //displaying
   result
```

Scilab code Exa 2.14 14

```
clc;
g=9.8;     //gravitational constant in m/sec square
t=2.5;     //time in sec
v=g*t;
disp(v,"Velocity in m/sec = ");      //displaying
   result
h=(1/2)*g*t*t;     //kinematical equation
disp(h,"Height in m = ");      //displaying result
```

Scilab code Exa 2.15 15

```
clc;
g=32;      //gravitational constant in ft/sec square
h=64;      //height in ft
t=(sqrt((2*h)/g));    //kinematical equation
disp(t,"Time in sec = ");      //displaying result
v=g*t;       //kinematical equation
```

```
7 disp(v,"Velocity in ft/sec = ");       //displaying
    result
```

Scilab code Exa 2.16 16

```
1 clc;
2 g=32;          //gravitational constant in ft/sec
    square
3 h=100;         //height in ft
4 v=sqrt(2*g*h);     //calculating velocity
5 disp(v,"Velocity in ft/sec = ");      //displaying
    result
```

Scilab code Exa 2.17 17

```
1 clc;
2 h=0.78;       //height in m
3 g=9.8;        //gravitational constant in m/sec square
4 v=0.5;        //velocity in m/sec
5 t=sqrt((2*h)/g);     //calculating t
6 disp(t,"Time required in sec = ");     //displaying
    result
7 s=v*t;       //calculating distance
8 disp(s,"Horizontal distance in m = ");    //
    displaying result
```

Scilab code Exa 2.18 18

```
1 clc;
2 v0=20;     //velocity in ft/sec
```

```
3 g=32;      //gravitational constant in ft/sec
4 t=2;       //time in sec
5 v=v0+(g*t);     //kinematical equation
6 disp(v,"Velocity in ft/sec = ");         //displaying
      result
7 s=(v0*t)+(1/2)*g*t*t;      //kinematical equation
8 disp(s,"Distance in ft = "); //displaying result
```

Scilab code Exa 2.19 19

```
1 clc;
2 v0=20;     //velocity in ft/sec
3 g=-32;      //gravitational constant in ft/sec
4 t=0.5;       //time in sec
5 v=v0+(g*t);     //kinematical equation
6 disp(v,"Velocity in ft/sec = ");         //displaying
      result
7 t=2;           //time in sec
8 s=v0+(g*t);      //kinematical equation
9 disp(s,"Distance in ft = "); //displaying result
```

Scilab code Exa 2.20 20

```
1 clc;
2 h=6;          //height in ft
3 g=32;         //gravitaional constant in ft/sec
     square
4 t=sqrt((2*h)/g);    //calculating time
5 disp(t,"Time in sec = "); //displaying result
```

Chapter 3

The Laws of Motion

Scilab code Exa 3.4 4

```
clc;
g=9.8;        //gravitational constant in m/sec square
m=100;        //mass in kg
disp(m*g,"Weight in Newton = ");
```

Scilab code Exa 3.5 5

```
clc;
g=9.8;        //gravitational constant in m/sec square
m=5;        //mass in kg
F=100;       //force in Newton
disp(m*g,"Weight in Newton = ");
a=F/m;       //calculating acc.
disp(a,"Accelaration in m/sec square = "); //
   displaying result
```

Scilab code Exa 3.6 6

```
clc;
g=9.8;          //gravitational constant in m/sec square
m=1;           //mass in kg
F=1;          //force in Newton
w=1;          //in Newton
a=F/m;         //calculating acc.
disp(a,"Accelaration in m/sec square = "); //
   displaying result
a=(F*g)/w;
disp(a,"Accelaration in m/sec square = ");    //
   displaying result
```

Scilab code Exa 3.7 7

```
clc;
g=9.8;          //gravitational constant in m/sec square
m=10;          //mass in kg
a=5;           //acc. in m/sec square
F=m*a;          //calculating force
disp(F,"Force in Newton = ");       //displaying
   result
```

Scilab code Exa 3.8 8

```
clc;
a=20;           //acc. in m/sec square
F=80;          //force in Newton
m=F/a;         //using F=m*a (Newton's Law)
disp(m,"Mass in kg = ");        //displaying result
```

Scilab code Exa 3.9 9

```
clc;
g=9.8;          //gravitational constant in m/sec square
m=60;          //mass in kg
a=2;        //acc. in m/sec square
F=(m*g)+(m*a);        //calculating force in Newton
disp(F,"Force in Newton = "); //displaying result
```

Scilab code Exa 3.10 10

```
clc;
m=1500;          //mass in kg
F=3000;        //force in Newton
t=5;           //time in sec
a=F/m;        //calculating acc. (Newton's Law)
disp(a,"Accelaration in m/sec square = "); //
   displaying result
v=a*t;         //kinematical equation
disp(v,"Velocity in m/sec = ");        //displaying
   result
```

Scilab code Exa 3.11 11

```
clc;
m=2000;          //mass in kg
a=1;        //acc. in m/sec square
F=m*a;           //Newton's Law
disp(F,"Force in Newton = "); //displaying result
```

```
6 m=3000;          //mass in kg
7 a=F/m;    //Newton's Law
8 disp(a,"Accelaration in m/sec square = ");    //
    displaying result
```

Scilab code Exa 3.12 12

```
1 clc;
2 v=20;           //velocity in m/sec
3 v0=10;          //velocity in m/sec
4 t=5;            //time in sec
5 a=(v-v0)/t;     //kinematical equation
6 disp(a,"Accelaration in m/sec square = ");     //
    displaying result
7 m=1000;        //mass in kg
8 a=2;      //acc. in m/sec square
9 F=m*a;         //Newton's Law
10 disp(F,"Force in Newton = "); //displaying result
```

Scilab code Exa 3.13 13

```
1 clc;
2 v=-20;           //velocity in m/sec
3 v0=15;          //velocity in m/sec
4 t=0.005;             //time in sec
5 a=(v-v0)/t;     //kinematical equation
6 disp(a,"Accelaration in m/sec square = ");     //
    displaying result
7 m=0.06;        //mass in kg
8 F=m*a;         //Newton's Law
9 disp(F,"Force in Newton = "); //displaying result
```

Scilab code Exa 3.14 14

```
clc;
m=1000;       //mass in kg
F=3000;       //force in Newton
a=F/m;       //calculating acc.
disp(a,"Accelaration in m/sec square = "); //
   displaying result
v0=30;    //initial velocity in m/sec
v=0;      //final velocity in m/sec
t=v0/a;     //uisng kinematical equation
a=-3;     //acc. inm/sec square
disp(t,"Time in sec = ");       //displaying result
s=(v0*t)+(1/2)*(a*t*t);       //kinematical equation
disp(s,"Distance in m = ");      //displaying result
```

Scilab code Exa 3.15 15

```
clc;
g=32;       //gravitational constant in ft/sec square
m=50;       //mass in slugs
w=m*g;      //calculating weight in lb
disp(w,"Weight in lb = ");
w=50;           //weight in lb
m=w/g          //calculating mass in slugs.
disp(m,"Mass in slugs = "); //displaying result
```

Scilab code Exa 3.16 16

```
clc;
g=32;       //gravitational constant in ft/sec square
w=160;          //weight in lb
m=w/g         //calculating mass in slugs.
disp(m,"Mass in slugs = "); //displaying result
```

Scilab code Exa 3.17 17

```
clc;
m=25;       //mass in slugsg
F=75;      //force in lb
a=F/m;      //calculating acc.
t=12;      //time in sec
disp(a,"Accelaration in ft/sec square = "); //
   displaying result
v=a*t;       //kinematical equation
disp(v,"Velocity in ft/sec = ");      //displaying
   result
```

Scilab code Exa 3.18 18

```
clc;
F=150;         //force in lb
g=32;         //gravitational constant in ft/sec
   square
w=96;          //weight in lb
m=w/g;     //calculating mass
disp(m,"Mass in slugs = "); //displaying result
a=F/m;          //calculating acc
disp(a,"Accelaration in ft/sec square = ");      //
   displaying result
```

Scilab code Exa 3.19 19

```
clc;
g=32;          //gravitational constant in ft/sec
   square
w=3200;          //weight in lb
m=w/g;     //calculating mass
disp(m,"Mass in slugs = "); //displaying result
v=44;           //velocity in ft/sec
t=8;            //time in sec
a=v/t;           //calculating acc
disp(a,"Accelaration in ft/sec square = ");      //
   displaying result
F=m*a;           //calculating force in lb
disp(F,"Force in lb = ");    //displaying result
```

Scilab code Exa 3.20 20

```
clc;
g=32;          //gravitational constant in ft/sec
   square
w=2400;          //weight in lb
m=w/g;     //calculating mass
disp(m,"Mass in slugs = "); //displaying result
F=750;           //force in lb
m=75;            //mass in slugs
a=F/m;           //calculating acc
disp(a,"Accelaration in ft/sec square = ");      //
   displaying result
v0=60;      //initial velocity in ft/sec
v=20;        //final velocity in ft/sec
a=-10;     //acc. in ft/sec square
```

```
13 t=(v-v0)/a;       //kinematical equation
14 s=(v0*t)+((1/2)*a*t*t);          //calculating
      distance in ft
15 disp(s,"Distance in ft = ");    //displaying result
```

Scilab code Exa 3.21 21

```
1 clc;
2 g=32;          //gravitational constant in ft/sec
      square
3 w=3200;           //weight in lb
4 m=w/g;     //calculating mass
5 disp(m,"Mass in slugs = "); //displaying result
6 F=800;           //force in lb
7 m=100;            //mass in slugs
8 a=F/m;           //calculating acc
9 disp(a,"Accelaration in ft/sec square = ");      //
      displaying result
```

Scilab code Exa 3.22 22

```
1 clc;
2 F=50-30;       //force in lb
3 w1=50;      //weight in lb
4 w2=30;        //weight in lb
5 m=(w1+w2)/g;    //calculating mass
6 disp(m,"Mass in slugs = "); //displaying result
7 a=F/m;       //Newton's Law
8 disp(a,"Accelaration in ft/sec square = ");    //
      displaying result
```

Chapter 4

Circular Motion and Gravitation

Scilab code Exa 4.1 1

```
clc;
r=1.5;                          //radius in ft
t=2;                            //time in sec
s=2*%pi*r;                      //calculating s using
    circumference of circle
                                //=2*3.14*r in ft
v=s/t;                          //calculating velocity
    using v=s/t in ft/sec
ac=(v*v)/r;                     //calculating
    centripetal accelaration in
                                        //ft/sec square.
disp(ac,"Centripetal Accelaration = "); //
    Displaying Result in ft/sec square.
```

Scilab code Exa 4.2 2

```
clc;
m=0.5;    //weight in kg
r=1;      //readius in metre
v=4;      //velocity in metre/sec
F=(m*v*v)/r;  //calculating centripetal force in
   Newton
disp(F,"Centripetal Force = ");  //displaying force
   in Newton
```

Scilab code Exa 4.3 3

```
clc;
F=1;          //force in Newton
m=0.1;        //m in kg
r=0.7;     //radius in metre
v=sqrt((F*r)/m);     //calculating v in m/sec
disp(v,"Velocity in metre/sec = ");    //displaying
   result.
```

Scilab code Exa 4.4 4

```
clc;
g=32        //gravitational constant in ft/sec square
   .
w=160         //weight in lb
r=20          //radius in ft
v=10          //velocity in ft/sec
m=w/g         //calculating mass in slugs
F=(m*v*v)/r; //calculating centripetal force in lb
disp(F,"Centripetal Force in lb = "); //displaying
   result.
```

Scilab code Exa 4.5 5

```
clc;
m=1000;     //mass in kg
r=30;       //radius in metre
v=9;        //velocity in metre/sec
F=(m*v*v)/r;  //calculating centripetal force in
   Newton.
disp(F,"Centripetal Force in Newton = ");  //
   displaying result.
```

Scilab code Exa 4.6 6

```
clc;
g=32      //gravitational constant in ft/sec square.
w=3200    //weight in lb
F=2000    //Maximum Force in lb
r=320     //radius in ft
m=w/g;    //calculating mass in slugs
v=sqrt((F*r)/m);  //calculating velocity in ft/sec
disp(v*0.682,"Velocity in min/hr = ");   //
   displaying velocity in min/hr.
```

Scilab code Exa 4.7 7

```
clc;
g=9.8;      //gravitaional constant in metre/sec
r=0.5;    //radius in metre
m=1;      //mass in kg
```

```
5 v=5;       //velocity in metre/sec
6 F=(m*v*v)/r;  //calculationg centripetal force in
    Newton
7 w=m*g;       //calculating weight in Newton
8 T=F-w;      //calculating Tension in string at top
    position in Newton
9 disp(T,"Tension in the string at the top position in
     Newton = "); //displaying result
10 T=F+w;   //calculating Tension at bottom of string
    in Newton.
11 disp(T,"Tension in the string at the bottom position
     in Newton = "); //    displaying Tension at
    bottom of string in Newton.
```

Scilab code Exa 4.8 8

```
1 clc;
2 G=3.44*10^-8;  //universal gravitational constant in
    lb.ft square/slug square
3 r=10   //radius in ft
4 w=2000;      //weight in lb
5 g=32;   //gravitational constant in ft/sec square
6 m=w/g;  //calculating mass in slugs
7 F=(G*m*m)/(r*r);  //calculating gravitational force
    in lb
8 disp(F,"Gravitational force in lb = ");  //
    displaying gravitational force in lb
```

Scilab code Exa 4.9 9

```
1 clc;
2 G=6.67*10^-11   //universal gravitational constant
    in Nm square/kg square.
```

```
m1=5.98*10^24;    //mass of earth in kg
m2=7.36*10^22;    //mass of moon in kg
r=3.84*10^8;      //radius of moon's orbit
F=(G*m1*m2)/(r*r);  //calculating gravitationalforce
    in Newton
v=sqrt((G*m1)/r);     //calculating velocity of moon
   in m/sec
s=2*%pi*r;     //calculating circumference of moon's
   orbit in metre
t=s/v;         //calculating time in sec
disp(F,"Gravitational Force in Newton = ");  //
   displaying gravitational force in Newton
disp(v,"Velocity in metre/sec = ");   //displaying
   velocity in metre
disp(t,"Time in sec = ");  //displaying time in sec.
disp(t/86400,"Time in days = ");  //displaying time
   in days
```

Scilab code Exa 4.10 10

```
clc;
r=6.4*10^6;  //radius of earth in m
g=9.8;  //gravitational constant in m/sec square
v=sqrt(r*g);  //calculating velocity in m/sec
disp(v,"Velocity in metre/sec = ");  //displaying
   result
```

Scilab code Exa 4.11 11

```
clc;
r=6400+1000;      //radius in metre
g=(6400/7400)*(6400/7400)*9.8;  //calculating g at
   1000km using g=(r earth/r)*g
```

```
4 disp(g,"Accelaration due to gravity at 1000km = ");
    //displaying result
```

Scilab code Exa 4.12 12

```
1 clc;
2 g=32          //gravitational constant in ft/sec
    square
3 w=128;        //mass in lb
4 F=(1/2)*(1/2)*128'  //calculating F in lb
5 m=w/g;        //calculating m in slugs
6 disp(F,"Weight at height above the earths surface of
    one earth radius = ");  //displaying weight
7 disp(m,"Mass of the girl in slugs= ");  //displaying
    mass in slugs
```

Scilab code Exa 4.13 13

```
1 clc;
2 T=24*60*60;    //time in sec
3 re=6.4*10^6;   //radius of earth in m
4 g=9.8;          //gravitational constant in m/sec
    square
5 r=(((6.4*10^6*6.4*10^6)*9.8*(8.64*10^4*8.64*10^4))
    /(4*%pi*%pi))^(1/3);  //calculating r in metre
6 disp(r,"Radius in metre = ");  //displaying radius
    in metre
7 h=r-re;     //h =altitude above earth's surface
8 disp(h,"Height above the earths Surface in metre = "
    );  //displaying height above earth's surface in
    m
```

```
9 disp(h/1000,"Height above the earths Surface in
    kilometre = "); //displaying height above earth'
    s surface in km)
```

Scilab code Exa 4.14 14

```
1 clc;
2 re=6.4*10^6; //radius of earth in m
3 g=9.8; //gravitational constant in m/sec square
4 G=6.67*10^-11; //Universal gravitational constant
    in Nm square/kg square
5 m=(g*re*re)/G; //calculating mass of earth in kg
6 disp(m,"Mass of Earth in kg = "); //diaplaying mass
    of Earth inkg
```

Scilab code Exa 4.15 15

```
1 clc;
2 G=6.67*10^-11 //Universal gravitational constant
    in Nmsquare/kg square
3 mm=7.36*10^22; //mass of moon in kg
4 r=1.74*10^6; //radius of moon in m
5 m=75; //weight of man in kg
6 g=(G*mm)/(r*r); //calculating g in m/sec square
7 w=m*g; //calculating weight in Newton
8 disp(g,"Accelaration due to gravity at its surface
    in m/sec square= "); //displaying g
9 disp(w,"Mans weight on moon in Newton = "); //
    displaying mass of man on moon.
```

Scilab code Exa 4.16 16

```
clc;
r=1.74*10^6;        //radius in m
gm=1.6;             //gravitational constant of moon in
    m/sec square
v=sqrt(r*gm);       //calculating velocity
disp(v,"Velocity in m/sec = ");    //displaying
   result
```

Chapter 5

Energy

Scilab code Exa 5.2 2

```
clc;
F=60;       //force in lb
s=10;       //distance inft
W=F*s;    //calculating weight
disp(W,"Weight in ft.lb = ");  //displaying result
```

Scilab code Exa 5.3 3

```
clc;
F=2000;       //force in lb
s=80;       //distance inft
W=F*s;    //calculating weight
disp(W,"Weight in ft.lb = ");  //displaying result
disp(W,"Potential Energy in ft.lb = ");    //
   displaying result
```

Scilab code Exa 5.4 4

```
clc;
g=9.8;        //gravitational constant in m/sec square
h=1.5;       //height in m
m=2;       //mass in kg
W=m*g*h;    //calculating weight
disp(W,"Weight in Joule = ");  //displaying result
disp(W,"Potential Energy in Joule = ");    //
   displaying result
```

Scilab code Exa 5.5 5

```
clc;
g=9.8;        //gravitational constant in m/sec square
m=2;       //mass in kg
W=m*g;    //calculating weight
disp(W,"Weight in Newton = ");  //displaying result
```

Scilab code Exa 5.7 7

```
clc;
F=150;      //F in lb
s=10;       //distance in ft
t=5;        //time in sec
P=(F*s)/t;   //Power in ft.lb/sec
disp(P/550,"Power in hp = ");    //displaying power
   in hp
```

Scilab code Exa 5.8 8

```
clc;
s=80;          //height in m
p=20;          //power of hoist in hp
m=500;        //weight in kg
g=9.8;        //gravitational constant in m/sec square
e=0.8;        //efficiency = 80 percent
F=m*g;        //Force in Newton
P=e*p*746;    //calculating power in watt
t=(F*s)/P;    //calculating time required
disp(t,"Time required in sec = ");  //displaying
   time required.
```

Scilab code Exa 5.9 9

```
clc;
v=10;         //velocity in min/hr
p=80;         //power required in hp
v=v*1.47;     //converting v to ft/sec
P=p*550;      //converting P to ft.lb/sec
F=P/v;        //calculating resistive force required
disp(F,"Resistive force required in lb = ");  //
   displaying resistive force required.
```

Scilab code Exa 5.10 10

```
clc;
p=1;    //power output in hp
p=1*746 //power output in Watt using 1hp = 746Watt
F=300; //Force in Newton
v=p/F; //calculating v in m/sec using P=F*v
disp(v,"Velocity in m/sec = ");  //displaying
   velocity in m/sec
```

Scilab code Exa 5.11 11

```
clc;
m=1000;      //mass in kg
v=20;        //velocity in m/sec
KE=(m*v*v)/2;  //calculating kinetic energy using KE
    =1/2*(m*v*v)
disp(KE,"Kinetic Energy in Joule = ");  //displaying
     kinetic energy in Joule.
```

Scilab code Exa 5.12 12

```
clc;
m=1;       //mass in kg
KE=1;      //Knetic Energy in Joule
v=sqrt((2*KE)/m);    //calculating velocity in m/sec
    using KE=1/2(m*v*v)
disp(v,"Velocity in m/sec = ");  //displaying
    velocity in m/sec
```

Scilab code Exa 5.13 13

```
clc;
v=15;         //velocity in ft/sec
w=128;        //weight in lb
g=32;         //g in ft/sec square
m=w/g;        //calculating m in slugs
KE=(1/2)*(m*v*v);  //calculating KE in ft.lb
disp(KE,"Kinetic Energy in ft.lb = ");  //displaying
     result
```

Scilab code Exa 5.14 14

```
clc;
w=2500;          //weight in lb
v=40;            //velocity in mi/hr
m=w/g;           //calculating mass in slugs
v=40*1.47;       //converting velocity in ft/sec
KE=(1/2)*(m*v*v);  //calculating Kinetic energy in
    ft.lb
disp(KE,"Kinetic Energy in ft.lb = ");  //displaying
     result
```

Scilab code Exa 5.15 15

```
clc;
h=7-3;    //height above ground in ft
g=32;     //g in ft/sec square
v=sqrt(2*g*h);  //calculating velocity in ft/sec
    since PE=KE
disp(v,"Velocity in ft/sec = ");  //displaying
    result
```

Scilab code Exa 5.16 16

```
clc;
v=20;    //velocity in m/sec
g=9.8;   //g in m/sec square
h=200;   //height in m
```

```
5 diff=(v*v)/(2*9.8*200);  //calculating Final KE/
    Initial PE
6 disp((1-diff)*100,"Percent of initial PE lost = ");
    //displaying result
```

Scilab code Exa 5.17 17

```
1 clc;
2 w=3;   //weight in lb
3 v=15;  //velocity in ft/sec
4 g=32;  //g in ft/sec square
5 s=(1/24); //s in ft
6 F=(w*v*v)/(2*g*s);  //calculating force exerted in
    lb
7 disp(F,"Force exerted in lb = "); //displaying
    result
```

Scilab code Exa 5.18 18

```
1 clc;
2 g=9.8;       //g in m/sec square
3 h=2;         //height in m
4 F=100;      //force in Newton
5 s=15;       //s in m
6 v=2;        //velocity in m/sec
7 m=30;       //mass in 30 kg
8 W=F*s;      //calculating work in Joule
9 delKE=(1/2)*(m*v*v);  //calculating change in KE in
    Joule
10 delPE=m*g*h;          //calculating change in PE in
    Joule
11 Wf=W-delKE-delPE;     //calculating work in Joule
```

```
12 Ff=Wf/s;                //calculating frictional force
       in Newton
13 disp(Ff,"Frictional Force in Newton = "); //
   displaying result
```

Scilab code Exa 5.19 19

```
1 clc;
2 t=1;          //time in sec
3 m=4*10^9;     //m in kg
4 c=3*10^8;     //velocity of light in m/sec
5 E=m*c*c;      //calculating Energy in Joule using
   Einstein's equation: E=m*c*c
6 P=E/t;        //calculating Power output in Watt
7 disp(P,"Power Output in Watt = "); //displaying
   result
```

Scilab code Exa 5.20 20

```
1 clc;
2 P=10^8;     //power in Watt
3 t=60*60*24;    //t in seconds for 1 day
4 E=P*t;        //calculating energy in Joule using E=P*
   t
5 m=E/(c*c);  //calculating m in kg using Einstein's
   equation:E=m*c*c
6 disp(m,"Mass in kg = "); //displaying result
```

Chapter 6

Momentum

Scilab code Exa 6.3 3

```
clc;
m=50;           //mass in kg
v=6;            //velocity in m/sec
p=m*v;        //calculating momentum
disp(p,"Momentum of woman in kg.m/sec = ");      //
   displaying result
```

Scilab code Exa 6.4 4

```
clc;
w=160;     //weight in lb
g=32;      //g in ft/sec square
m=w/g;     //calculating m in slugs
v=(1*5280)/(4*60)'  //calculating v in ft/sec
mom=m*v;            //calculating avg. momentum in
   slug.ft/sec
disp(mom,"Average Momentum in slug.ft/sec = ");  //
   displaying result
```

Scilab code Exa 6.6 6

```
clc;
mr=5;       //weight of rifle in kg
mb=0.015;   //weight of bullet in kg
vb=600;     //velocity of bullet in m/sec
vr=(mb*vb)/mr;  //calculating vr using law of
   conservation of momentum
disp(vr,"Recoil velocity of rifle in m/sec = ");  //
   displaying result
```

Scilab code Exa 6.7 7

```
clc;
wa=300;  //weight of astronaut in lb
ww=1;    //weight in of wrench lb
vw=15;   //velocity of wrench in ft/sec
va=(ww*vw)/wa;   //calculating va using law of
   conservation of momentum
disp(va,"Velocity of astronaut in ft/sec = ");  //
   displaying result
```

Scilab code Exa 6.8 8

```
clc;
mm=70;  //weight in of man kg
ms=0.5; //weight of snow-ball in kg
v1=20;  //man's initial velocity in m/sec
v2=(ms/(mm+ms))*v1;  //calculating v2 using law of
   conservation of momentum
```

```
6 disp(v2,"Mans final velocity in m/sec = "); //
    displaying result
```

Scilab code Exa 6.9 9

```
1 clc;
2 m1=40;     //weight in kg
3 m2=60;     //weight in kg
4 v1=4;      //speed in m/sec
5 v2=2;      //speed in m/sec
6 v3=((m1*v1)+(m2*v2))/(m1+m2);  //calculating v3
    using law of conservation of momentum
7 disp(v3,"Final velocity in m/sec = "); //displaying
    result
8 inKE=(1/2)*(m1*v1*v1)+(1/2)*(m2*v2*v2);  //
    calculating initial KE in Joules
9 fiKE=(1/2)*(m1+m2)*v3*v3;  //calculating final KE in
    Joules
10 disp(inKE-fiKE,"Kinetic Energy lost in Joules = ");
    //displaying result.
```

Scilab code Exa 6.10 10

```
1 clc;
2 m1=40;    //weight in kg
3 m2=60;    //weight in kg
4 v1=4;     //velocity in m/sec
5 v2=-2;    //velocity in m/sec
6 v3=((m1*v1)+(m2*v2))/(m1+m2);  //calculating v3
    using law of conservation of momentum
7 disp(v3,"Final velocity in m/sec = "); //displaying
    result.
```

```
8  fiKE=(1/2)*(m1+m2)*v3*v3;     //calculating initial
     KE in Joules
9  inKE=(1/2)*((m1*v1*v1)+(m2*v2*v2));  //calculating
     final KE in Joules
10 disp(inKE-fiKE,"Kinetic Energy lost in Joules = ");
     //displaying result.
```

Chapter 7

Relativity

Scilab code Exa 7.5 5

```
clc;
l=4;          //height in ft
v=0.444;     //v=(v/c)^2 (given)
l0=l/sqrt(1-v);      //calculating using l=l0sqrt(1-(
   v/c)^2)
disp(l0,"Astronauts height at rest in ft = "); //
   displaying result
```

Scilab code Exa 7.6 6

```
clc;
m=0.934;          //v=(v/c)^2 (given)
v=2.9*10^8;       //velocity in m/sec
t0=2.2*10^-6;     //initial velocity in m/sec
t=t0/sqrt(1-m);      //calculating t using t=t0/sqrt
   (1-(v/c)^2)
disp(t,"Time in sec = ");       //displaying result
```

Scilab code Exa 7.7 7

```
clc;
t0=3600;        //time in sec
t=3601;         //time in sec
c=3*10^8;       //velocity in m/sec
v=c*sqrt((1-(t0/t)^2));      //calculating velocity
disp(v,"Velocity in m/sec = ");      //displaying
    result
```

Scilab code Exa 7.8 8

```
clc;
m0=9.1*10^-31;        //mass in kg
t=0.998;         //t=(v/c)^2 (given)t
m=m0/(sqrt(1-(t)));       //calculating mass in kg
disp(m,"Mass in kg = ");      //displaying result
```

Scilab code Exa 7.9 9

```
clc;
m=0.980;        //m=(m0/m)^2 (given)
c=186000;       //velocity in m/sec
v=c*(sqrt(1-m));       //calculating velocity
disp(v,"Velocity in min/sec = ");     //displaying
    result
```

Chapter 8

Fluids

Scilab code Exa 8.3 3

```
clc;
dg=1200;    //density in lb/ft cube
v=1/1728;    //in ft cube/in cube
w=dg*v;        //calculating weight
disp(w,"Weight in lb = ");      //displaying result
```

Scilab code Exa 8.4 4

```
clc;
m=58;        //mass in kg
v=0.1*0.2*4;    //calculating volume using v=l*b*h in
    m cube
d=m/v;  //calculating density using d=m/v in kg/m
   cube
dw=1000;  //density of water in kg/m cube
spgr=d/dw;  //calculating specific gravity of oak
disp(spgr,"Specific Gravity of Oak = ");  //
   displaying result.
```

```
8 disp("Since specific gravity of oak is less than
    that of water (ie. 1), it floats in water");   //
    displaying result.
```

Scilab code Exa 8.5 5

```
1 clc;
2 dg=0.08;      //weight density of air in lb/ft cube
3 v=12*12*10;   //calculating volume using v=l*b*h in
    ft cube
4 w=dg*v; //calculating weight in lb using weight=
    weight density*volume
5 disp(w,"Weight of the air in lb = ");  //displaying
    result.
```

Scilab code Exa 8.6 6

```
1 clc;
2 w=500; //weight in lb
3 dg=62;  //density in lb/ft cube
4 v=w/dg; //calculating volume using density=mass/
    volume
5 disp(v,"Volume in ft cube = ");  ////displaying
    result.
```

Scilab code Exa 8.7 7

```
1 clc;
2 F=130;  //force in lb
3 r=1;    //radius in inch
```

```
4 A=%pi*r*r;  //calculating Area using area=pi*r*r in
    in square
5 p=F/A;      //calculating pressure in lb/in square
    using p=F/area
6 disp(p,"Pressure exerted on ground in lb/in square =
    ");  //displaying result.
7 disp(p/14.7,"Times greater than atmospheric pressure
    .");  //displaying result.
```

Scilab code Exa 8.8 8

```
1 clc;
2 m=20000;  //mass in kg
3 A=60;     //area in metre square
4 g=9.8;    //gravitational constant in m/sec square
5 F=m*g;    //calculating force in Newton
6 p=F/A;    //calculating pressure in Pascal
7 disp(p,"Pressure in Pascal = ");  //displaying
    result.
8 disp(p/(1.013*10^5),"Pressure in atm = ");  //
    displaying result.
```

Scilab code Exa 8.9 9

```
1 clc;
2 pa=14.7;   //atm pressure in lb/in square
3 dg=62;   //density in lb/ft cube
4 h=6/144;   //in ft cube/in square
5 p=pa+(dg*h);       //calculating pressure
6 disp(p,"Pressure in lb/in square = ");     //
    displaying result
```

Scilab code Exa 8.10 10

```
clc;
g=9.8;          //gravitational constant in m/sec
   square
d=1.03*10^3;    //density of sea water in kg/m cube
depth=50;       //depth in m
side=20;        //length of side in cm
p=d*depth*g;    //calculating pressure on window
A=side*side*10^-4;  //calculating area in metre
   square
F=p*A;      //calculating FOrce in Newton
disp(F,"Force acting on window in Newton = ");    //
   displaying result.
```

Scilab code Exa 8.11 11

```
clc;
w=200;      //weight in lb
ds=64;      //weight density of seawater in lb/ft cube
dg=480;     //weight density of iron in lb/ft cube
V=w/dg;     //calculating V using dg=w/V in ft cube
w1=ds*V;    //calculating weight of seawater
   displaced by anchor in lb
bf=w-w1;  //calculating net force in lb
disp(bf,"Net Force to support in lb = ");  //
   displaying result.
```

Scilab code Exa 8.12 12

```
clc;
r=2;          //side in m
m=70;         //mass of man in kg
d=10^3;       //density in kg/m cube
V=m/d;        //calculating Volume in m cube
A=r*r;        //calculating area in m square
h=V/A;        //calculating height using vol=height*
   area in metre
disp(h,"Height in metre = ");   //displaying result.
```

Scilab code Exa 8.13 13

```
clc;
dice=920;  //desity of ice in kg/m cube
dwater=1030;  //density of water in kg/m cube
vsub=dice/dwater;  //calculating percentage volume
   of iceberg that is submerged using relation:dice*
   g*v=dwater*g*vsub
disp(vsub*100,"Percentage of volume of submerged
   iceberg = ");  //displaying result.
```

Scilab code Exa 8.14 14

```
clc;
v=100*0.134;       //volume in ft cube
w1=50;            //weight in lb
dg=42;            //density in lb/ft cube
dgw=64;           //density in lb/ft cube
w=w1+(dg*v);      //calculating weight
disp(w,"Weight in lb = "); //displaying result
F=dgw*v;      //calculating force
disp(F,"Maximumforce in lb = ");     //displaying
   result
```

Scilab code Exa 8.15 15

```
clc;
w1=40000;              //weight in lb
dga=0.08;              //density in lb/ft cube
dgh=0.011;             //density in lb/ft cube
v=w1/(dga-dgh);        //calculating volume
disp(v,"Volume in ft cube = "); //displaying result
```

Chapter 9

Heat

Scilab code Exa 9.2 2

```
clc;
tf=80;      //temp in farenheit
tc=(5/9)*(tf-32);    //calculating temp in celcius
disp(tc,"Temperature in celcius = ");  //displaying
    result
```

Scilab code Exa 9.3 3

```
clc;
tc=80;      //temp in celcius
tf=((9/5)*tc)+32;    //calculating temp in farenheit
disp(tf,"Temperature in farenheit = ");  //
    displaying result
```

Scilab code Exa 9.4 4

```
clc;
tf=-362;      //temp in farenheit
tc=(5/9)*(tf-32);    //calculating temp in celcius
disp(tc,"Temperature in celcius = ");  //displaying
   result
```

Scilab code Exa 9.5 5

```
clc;
tc=-210;      //temp in celcius
tf=((9/5)*tc)+32;    //calculating temp in farenheit
disp(tf,"Temperature in farenheit = ");  //
   displaying result
```

Scilab code Exa 9.6 6

```
clc;
delt=80-20;      //change in temp in celcius
m=3;          //mass in lb
c=4185;       //specific heat in J/kg.celcius
Q=m*c*delt;     //calculating heat required
disp(Q,"Heat required in Joule = ");  //displaying
   result
```

Scilab code Exa 9.7 7

```
clc;
Q=200;    //heat in Btu(British Thermal Unit)
m=50;     //mass in lb
c=0.5;    //specific heat capacity inBtu/lb.F
```

```
5 delT=Q/(m*c);  //calculating change in temperatur
    using Q=mc(del T)
6 disp(delT,"Change in Temperature in Farenheit = ");
     //displaying result.
7 disp(25-delT,"Final Temperature in Farenheit = ");
     //displaying result.
```

Scilab code Exa 9.8 8

```
1 clc;
2 Q=10;     //Heat in kilo calorie
3 m=1;      //mass in kg
4 delT=24;  //change in temperature in degree celcius
5 c=Q/(m*delT);   //calculating specific heat in kcal
    /(kg.degree celcius)
6 disp(c,"Spacific Heat in kcal/(kg.degree celcius) =
    ");  //displaying result.
```

Scilab code Exa 9.9 9

```
1 clc;
2 t=500/8;       //using heat gained = heat lost
3 disp(t,"Final temperature in Farenheit = ");     //
    displaying result
```

Scilab code Exa 9.10 10

```
1 clc;
2 t=(225990+3360)/2769;           //calculating
    temperature
```

```
3 disp(t,"Temperature in celcius = ");      //
    displaying result
```

Scilab code Exa 9.11 11

```
1 clc;
2 t=56.6/0.22;           //calculating temperature
3 disp(t,"Temperature in celcius = ");      //
    displaying result
```

Scilab code Exa 9.12 12

```
1 clc;
2 delT=626-70;     //change in temp. in Farenheit
3 m=200;           //mass in lb
4 c=0.03;          //specific heat capacity in Btu/(lb.
    Farenheit)
5 Lf=10.6;         //Latent Heat of Fusion in Btu/lb
6 Q=(m*c*delT)+(m*Lf); //calculating heat in Btu
7 disp(Q,"Heat Required in Btu = ");   //displaying
    result.
```

Scilab code Exa 9.13 13

```
1 clc;
2 mw=5;    //mass of water in kg
3 c=1;     //specific heat of water in kcal/(kg.degree
    celcius)
4 delT=40;  //change in temp in celcius
5 Lf=80;    //Latent heat of Fusion in kcal/kg
```

```
6 mice=(mw*c*delT)/Lf;    //calculating mass of ice in
    kg
7 disp(mice,"Mass of Ice in kg = ");      //displaying
    result.
```

Scilab code Exa 9.14 14

```
1 clc;
2 m1=2;     //mass of water in kg
3 c=1;      //specific heat in kcal/kg.celcius
4 delT=20; //change in temp. in celcius
5 L=540;    //L in kcal/kg
6 Q1=m1*c*delT;      //calculating heat in kcal
7 Q2=500-Q1;         //calculating heat available to
    convert water at 100 celcius to steam
8 msteam=Q2/L;  //calculating mass of steam in kg
9 disp(msteam,"Steam produced in kg = ");  //
    displaying result.
```

Scilab code Exa 9.15 15

```
1 clc;
2 deltice=10;      //change in temp of ice in celcius
3 deltwater=20;    //change in temp of water in celcius
4 mwater=0.5;      //mass of water in kg
5 cwater=4.185;    //specific heat of water in kJ/kg.
    celcius
6 Lice=335;        //latent heat in kJ/kg
7 cice=2.09;       //specific heat of ice in kJ/kg.
    celcius
8 mice=(mwater*cwater*deltwater)/((cice*deltice)+Lice)
    ;
```

```
9 disp(mice*1000,"Minimum amount of ice in gram = ");
    //displaying result.
```

Scilab code Exa 9.18 18

```
1 clc;
2 g=9.8;       //gravitational constant in m/sec square
3 Lf=3.35*10^5;              //Latent heat of fusion in
    J/kg
4 h=Lf/g;         //calculating height in metre using
    potential energy(m*g*h)=(mass*heat of fusion)
5 disp(h,"Height of falling in metre = ");    //
    displaying result.
```

Scilab code Exa 9.19 19

```
1 clc;
2 m=0.8;      //mass of water in kg
3 c=4185;     //specific heat in J/kg.celcius
4 delT=100-20;  //change in temperature in celcius
5 Q=m*c*delT;  //calculating heat required in Joule
6 P=10^3;       //Power in J/sec
7 t=Q/P;       //calculating time using P=(Q/t)
8 disp(t,"Time required to raise temperature to 100
    degree celcius in second = ");     //displaying
    result.
9 disp(t/60,"Time in minutes = ");    //displaying
    result.
```

Chapter 10

Kinetic Theory of Gases

Scilab code Exa 10.4 4

```
clc;
gp=200;       //gauge pressure in lb/in square
atmp=15;      //atmospheric pressure in lb/in square
p1=gp+atmp;    //pressure in lb/in square
v1=3;          //volume in ft cube
p2=15;          //pressure at sea-level in lb/in
   square
v2=(p1*v1)/p2;    //calculating pressure in ft cube
   using Boyle's law  ie. p1*v1=p2*v2 at constant
   temperature
disp(v2,"Volume occupied in ft cube = ");      //
   displaying result.
```

Scilab code Exa 10.5 5

```
clc;
p1=300+15;          //absolute pressure in lb/in
   square
```

```
3 p2=15;                //pressure in lb/in square
4 v1=3;                 //volume in ft cube
5 v2=(p1*v1)/p2;        //calculating v2 using Boyle's law
      at const. temp.
6 disp(v2,"Volume in ft cube = ");     //displaying
     result.
7 disp(v2-43,"Additional Volume of air in ft cube = ")
     ;  //displaying result.
```

Scilab code Exa 10.6 6

```
1 clc;
2 Tc=-196;       //Boiling Point of Nitrogen in celcius
3 Tk=Tc+273;     //calculating B.P. in Kelvin using
     Kelvin=Celcius+273
4 disp(Tk,"Boiling Point of Nitrogen in Kelvin = ");
     //displaying result.
```

Scilab code Exa 10.7 7

```
1 clc;
2 tk=6000;        //temperature in Kelvin
3 disp(tk-273,"Temperature in celcius = ");     //
     displaying result
```

Scilab code Exa 10.8 8

```
1 clc;
2 t1=273;        //temperature in Kelvin
3 v2=2;          //twice v1
```

```
4 disp((t1*v2)-273,"Temperature in celcius = "); //
    displaying result
```

Scilab code Exa 10.9 9

```
1 clc;
2 T1=283;          //temperature Kelvin
3 T2=322;         //temp. in Kelvin
4 p1=35;          //pressure in lb/in square
5 p2=(T2*p1)/T1;     //calculating p2 using ideal gas
    equation since,v1=v2
6 disp(p2,"Pressure in lb/in square = "); //
    displaying result.
```

Scilab code Exa 10.10 10

```
1 clc;
2 t1=293;       //temp in Kelvin
3 t2=233;       //temp in Kelvin
4 v1=0.1;       //volume in m cube
5 p1=10;        //pressure in atm
6 p2=1;         //pressure in atm
7 v2=(p1*v1*t2)/(t1*p2);    //calculating v2 using
    ideal gas law
8 p3=1;         //pressure in atm
9 v3=(p1*v1)/p3;       //calculating volume using ideal
     gas law
10 disp(v2-0.1,"(a)Volume of ballon in m cube = "); //
    displaying result.
11 disp(v3-0.1,"(b)Volume of ballon after Helium
    absorbs heat from air  in m cube = "); //
    displaying result.
```

Scilab code Exa 10.11 11

```
clc;
d1=1.293;          //density in kg/m cube
t1=273;            //temperature in Kelvin
p2=2;              //pressure in atm
t2=373;            //temperature in Kelvin
p1=1;              //pressure in atm
d2=(d1*t1*p2)/(t2*p1);     //calculating density
   using ideal gas law in kg/m cube
disp(d2,"Density in kg/m cube = ");     //displaying
   result
```

Scilab code Exa 10.12 12

```
clc;
o=16.00;       //atomic mass of O
h=1.008;      //atomic mass of H
mh2o=(o+2*h)*1.66*10^-27;       //mass of H2O molecule
disp(mh2o,"Mass of H20 molecule in kg = ");    //
   displaying result
c=12.01;       //atomic mass of carbon
m=((2*c)+o+(6*h))*1.66*10^-27;       //mass of C2H6O
   molecule
disp(m,"Mass of Ethyl Alcohol molecule in kg = ");
       //displaying result
```

Scilab code Exa 10.13 13

```
clc;
m=1;       //mass of H2O in kg
m1=2.99*10^-26;       //mass of H2O molecule in kg
mo=m/m1;          //calculating no. of molecules of
   H2O using no=mass of H2O/mass of H2) molecule
disp(mo,"Molecules of H2O = ");          //displaying
   result
```

Scilab code Exa 10.14 14

```
clc;
k=1.38*10^-23;     //Boltzmann's constant in J/K
tk=273+100;       //absolute temp (in Kelvin)
KE=3/2*(k*tk);    //calculating average Kinetic
   Energy in Joule using kinetic theory of gases
disp(KE,"Average Kinetic Energy in Joule = ");     //
   displaying result
```

Scilab code Exa 10.15 15

```
clc;
k=1.38*10^-23;          //Boltzmann's constant in J/K
t=100+273;              //temperature in Kelvin
m=5.3*10^-26;           //mass of oxygen molecule in
   kg
v=sqrt((3*k*t)/m);      //calculating average
   velocity using kinetic theory of gases.
disp(v,"Average velocity of molecules in m/sec = ");
      //displaying result
```

Chapter 11

Thermodynamics

Scilab code Exa 11.4 4

```
clc;
lf=335;      //heat of fusion in kJ/kg
g=9.8;       //gravitational constant in m/sec square
h=lf/g;      //height in km
disp(h,"Height in km = ");      //displaying result
```

Scilab code Exa 11.6 6

```
clc;
hc=1.1*10^4;      //heat of combustion of heat oil in
    kcal/kg
p=10^6;         //Power in Watt
t=3600*24;        //time in sec
w=p*t;           //calculating power produced in a
   day in Joule
e=0.4;           //efficiency
hi=w/e;          //Heat input in Joule sice efficiency
   =output/input
```

```
8 hi=hi/(4.185*10^3);    //for calculating heat input
    in kcal
9 m=hi/hc;      //amount of fuel burnt each day in kg
10 disp(m,"Amount of fuel burnt each day in kg = ");
    //displaying result
```

Scilab code Exa 11.7 7

```
1 clc;
2 w=40000;      //weight in lb
3 t=3600;       //time in sec
4 g=32;         //gravitational constant in ft/sec
    square
5 v1=2500;      //initial velocity in m/sec
6 v2=400;       //final velocity in m/sec
7 W=(w/(2*g))*((v1*v1)-(v2*v2));  //calculating Work
    done in ft.lb using work done=difference in
    Kinetic Energy
8 p=W/(t*550);       //calculating Power using P=W/t
    since 1hp=550 ft.lb/sec;
9 disp(p,"Power Ouput in hp = ");       //displaying
    result
```

Scilab code Exa 11.8 8

```
1 clc;
2 t1=327+273;       //temp in Kelvin
3 t2=127+273;       //temp in Kelvin
4 eff=1-(t2/t1);    //calculating efficiency
5 hi=4185;          //1 kcal=4185 Joule
6 W=eff*hi;         //calculating Work in joule
7 disp(W,"Work in Joule = ");    //displaying result
```

Scilab code Exa 11.9 9

```
clc;
woa=3000;           //work ouput of a in Joule
wob=2000;           //work output of b in Joule
woc=1000;           //work output of c in Joule
hi=4185;            //1 kcal=4185 Joule
t1=500;             //temp in Kelvin
t2=300;             //temp in Kelvin
eff=1-(t2/t1);      //efficiency
effa=woa/hi;       //calculating efficiency of a
effb=wob/hi;       //calculating efficiency of b
effc=woc/hi;       //calculating efficiency of c
disp(effa*100,"Efficiency of A = ");         //
   displaying result
disp(effb*100,"Efficiency of B = ");         //
   displaying result
disp(effc*100,"Efficiency of C = ");         //
   displaying result
```

Scilab code Exa 11.10 10

```
clc;
t1=267+273;         //temp in Kelvin
eff=0.25;           //efficiency
t2=t1*(1-eff);      //calculating t2 using eff=1-(t2/t1
   )
disp(t2-273,"Temperature in celcius = ");       //
   displaying result
```

Scilab code Exa 11.11 11

```
1 clc;
2 t1=34+273;        //temperature in Kelvin
3 t2=35+273;        //temperature in Kelvin
4 r=((t2^4)-(t1^4))/(t1^4);     //calculating
     percentage difference in radiation
5 disp(r*100,"Percentage difference in radiation = ");
         //displaying result
```

Chapter 12

Electricity

Scilab code Exa 12.7 7

```
clc;
e=1.6*10^-19;     //charge on an electron in coulomb
q=10^-12;         //charge on pith ball in coulomb
n=q/e;            //calculating no of electrons
disp(n,"No. of electrons = ");     //displaying
   result
```

Scilab code Exa 12.8 8

```
clc;
k=9*10^9;      //constant in free space in N.m square
   /C square
q1=4*10^-9;    //charge in coulomb
q2=5*10^-8;    //charge in coulomb
r=5*10^-2;     //radius in metre
F=(k*q1*q2)/(r*r);     //calculating force in Newton
disp(F,"Force in Newton = ");      //displaying
   result
```

Scilab code Exa 12.9 9

```
clc;
k=9*10^9;      //constant in free space in N.m square
   /C square
q1=1.6*10^-19;    //charge in coulomb
q2=1.6*10^-19;    //charge in coulomb
r=5.3*10^-11;     //radius in metre
F=(k*q1*q2)/(r*r);     //calculating force in Newton
disp(F,"Force in Newton = ");      //displaying
   result
```

Scilab code Exa 12.10 10

```
clc;
q1=5*10^-7;           //charge in coulomb
q2=2*10^-7;           //charge in coulomb
k=9*10^9;             //constant in N.m square/
   coulomb square
F=10^2;               //force in Newton
r=sqrt((k*q1*q2)/F);    //calculating r using Coulomb
   's law
disp(r*10^3,"Distance between them in mm = ");
   //displaying result
```

Scilab code Exa 12.12 12

```
clc;
k=9*10^9;           //constant in N.m square/kg
   square
```

```
3 G=6.67*10^-11;      //universal gravitational
     constant in N.m square/kg square
4 m1=1.67*10^-27;     //mass in kg
5 m2=1.67*10^-27;     //mass in kg
6 mp=1.6*10^-19;      //mass of proton in kg
7 Fg=G*m1*m2;
8 Fe=k*mp*mp;
9 d=Fe/Fg;
10 disp(d,"Times electric force is greater than
     gravitational force"); //displaying result
```

Scilab code Exa 12.13 13

```
1 clc;
2 F=8.2*10^-8;          //force in Newton
3 e=1.6*10^-19;         //charge on an electron in
     Coulomb
4 E=F/e;                //calculating electric field in
     V/m using E=F/Q
5 disp(E,"Electric field in v/m = ");      //
     displaying result
```

Scilab code Exa 12.14 14

```
1 clc;
2 e=1.6*10^-19;     //charge on an electron in coulomb
3 E=5*10^3;         //electric field in V/m
4 m=3.3*10^-26;     //mass of neon ion in kg
5 F=E*e;            //calculating foece in Newton using
     F=Q*E
6 a=F/m;            //calculating accelaration in m/sec
     square using Newton's Law(F=m*a)
```

```
7 disp(F,"Force on neon Ion in Newton = ");      //
    displaying result
8 disp(a,"Accelaration of the ion in m/sec square");
      //displaying result
```

Scilab code Exa 12.15 15

```
1 clc;
2 m=1.67*10^-27;      //mass of proton in kg
3 g=9.8;              //gravitational constant in m/sec
    square
4 e=1.6*10^-19;       //charge on electron in coulomb
5 E=(m*g)/e;          //calculating Electric field in V/
    m using e*E=m*g
6 disp(E,"Electric Field in V/metre = ");      //
    displaying result
```

Scilab code Exa 12.16 16

```
1 clc;
2 Q=50;          //charge in Coulomb
3 V=7*10^6;      //Potential difference in Volt
4 W=Q*V;         //calculating energy dissipated in
    Joule
5 disp(W,"Power dissipated in Joule = ");     //
    displaying result
```

Scilab code Exa 12.17 17

```
1 clc;
```

```
2 V=20;              //potential difference in Volt
3 E=500;             //Electric field in V/m
4 s=V/E;             //calculating distance between them
     in metre using s=V/E
5 disp(s,"Distance between the plates in metre = ");
       //displaying result
6 disp(s*100,"Distance between the plates in cm = ");
       //displaying result
```

Scilab code Exa 12.18 18

```
1 clc;
2 E=600;       //electric field in volt/metre
3 s=0.15;      //distance between plates in metre
4 r=0.05;      //distance in m
5 V=E*s;       //calculating potential difference in
     Volt
6 disp(V,"(a)Potential Difference in Volt = ");
     //displaying result
7 Q=10^-10;     //charge in coulomb
8 F=Q*E;       //calculating force in Newton
9 disp(F,"Force on the charge of 10^-10 C in Newton =
     ");    //displaying result
10 KE=F*r;        //calculating Kinetic Energy in Joule
11 disp(KE,"Kinetic Energy in Joule = ");       //
     displaying result
```

Scilab code Exa 12.19 19

```
1 clc;
2 m=9.1*10^-31;      //mass of electron in kg
3 v=10^7;            //velocity of electron in m/sec
4 e=1.6*10^-19;      //charge on electron in coulomb
```

```
5 KE=(1/2)*(m*v*v);  //Kinetic Energy of electron in
    Joule
6 V=KE/e;           //calculating potential difference
    in Volt
7 disp(KE,"Kinetic Energy in Joule = ");  //displaying
     result
8 disp(V,"Potential difference in Volt = ");    //
    displaying result
```

Scilab code Exa 12.20 20

```
1 clc;
2 V=12;      //potential diff in volt
3 Q=15;      //charge per time in Coulomb/sec
4 t=3600;    //time (seconds in an hour)
5 P=V*Q;     //calculating power in Watt
6 W=P*t;     //work done in Joule
7 disp(P,"Power in Watt = ");    //displaying result
8 disp(W,"Work done in 1 hr in Joule = ");     //
    displaying result
```

Chapter 13

Electric Current

Scilab code Exa 13.5 5

```
clc;
e=1.6*10^-19;       //charge on an electron in
   coulomb
i=1;                //current in Ampere
n=i/e;              //calculating no of electrons/sec
disp(n,"No. of electrons flowing per second = ");
      //displaying result
```

Scilab code Exa 13.6 6

```
clc;
v=120;     //potential diff in Volt
r=12;      //resistance in ohms
i=v/r;     //calculating current in Ampere using Ohm'
   s law ie. V=I*R
disp(i,"Current in the toaster in Ampere = ");     //
   displaying result
```

Scilab code Exa 13.7 7

```
clc;
v=120;      //potential diff in volt
i=25;       //current in Ampere
r=v/i;     //Ohm's law
disp(r,"Resistance in ohm = ");     //displaying
    result
```

Scilab code Exa 13.8 8

```
clc;
v=240;      //potential diff in volt
p=2000;     //power in Watt
disp((p/v),"Current in Ampere = ");     //displaying
    result
```

Scilab code Exa 13.9 9

```
clc;
pi=12*746;     //input power in Watt sice 1hp=746
    Watt
i=30;          //current in Ampere
v=240;         //potential difference in volt
po=v*i;        //calculating output power using p=v*i
e=po/pi;       //calculating efficiency using eff=
    oupt/input
disp(e*100,"Efficiency of the generator = ");      //
    displaying result
```

Scilab code Exa 13.10 10

```
clc;
i=15;       //current in Ampere
v=240;      //potential diff. in Volt
t=45/60;    //time in hours
p=v*i;      //clculating power in Watt using p=v*i
w=p*t;      //calculating work done in Watt.h using w
   =p*t
disp(w/1000,"Work done in  kiloWatt.hr = ");    //
   displaying result
```

Scilab code Exa 13.11 11

```
clc;
v=12;    //potential diff. in volt
i=20;    //current in Ampere
t=3600;      //time in sec
p=v*i;    //power in Watt using p=v*i
w=p*t;    //calculating work in Joule using w=p*t
disp(w,"Work done in Joule = ");     //displaying
   result
```

Scilab code Exa 13.12 12

```
clc;
p=60;       //power in Watt
c=80;       //car capacity in Ampere.hr
t=3600;     //time in seconds
```

```
5 v=12;        //potential diff. in volt
6 q=c*t;       //charge in Ampere.sec = Coulomb
7 w=q*v;       //energy provided in Joule
8 t=w/p;       //calculating time in second
9 disp(w,"(a) Energy stored in the battery in Joule =
    ");     //displaying result
10 disp(t/3600,"(b) Time the battery is on in hours = "
    );      //displaying result
```

Scilab code Exa 13.13 13

```
1 clc;
2 v=600;        //potential diff. in volt
3 i=10;         //current in Ampere
4 r=v/i;        //calculating resistence in ohm using
    ohm's law ie.v=i*r
5 disp(r,"Resistence in Ohm = ");       //displaying
    result
```

Scilab code Exa 13.14 14

```
1 clc;
2 v=60;              //potential diff in volt
3 r1=5;        //resistance in Ohm
4 r2=5;        //resistance in Ohm
5 r3=5;        //resistance in Ohm
6 r=r1+r2+r3;     //resistance in series
7 disp(r,"Resistance in Series in Ohm = ");      //
    displaying result
8 i=v/r;                 //calculating current in
    Ampere using Ohm's law ie. V=I*R
9 disp(i,"Current in the entire circuit in Ampere = ")
    ;   //displaying result
```

Scilab code Exa 13.15 15

```
clc;
v=60;              //potential diff in volt
r=5;         //resistance in Ohm
r1=5;        //resistance in Ohm
r2=5;        //resistance in Ohm
r3=5;        //resistance in Ohm
rp=(r1)^-1+(r2)^-1+(r3)^-1;     //resistance in
   series
disp((rp^-1),"Resistance in Parallel in Ohm = ");
       //displaying result
i=v/r;                  //calculating current in
   Ampere using Ohm's law ie. V=I*R
disp(i,"Current in the entire circuit in Ampere = ")
   ;   //displaying result
```

Scilab code Exa 13.16 16

```
clc;
v=120;       //potential diff in volt
r1=240;      //resistance in ohm
r2=240;      //resistance in ohm
r=r1+r2;     //resistance in series
i=v/r;       //calculating current in Ampere using Ohm
   's law
disp(i,"(a)Current in each bulb in Ampere = ");   //
   displaying result
p=i*i*r1;     //calculating power dissipated in each
   bulb in Watt
disp(p,"(b)Power dissipated in each bulb in Watt = "
   );   //displaying result
```

Scilab code Exa 13.17 17

```
1 clc;
2 v=120;      //potential diff in volt
3 r=240;      //resistance in ohm
4 i=v/r;      //current in Ampere using Ohm's law
5 disp(i,"(a)Current in each bulb in Ampere = ");
    //displaying result
6 p=i*i*r;    //power in Watt
7 disp(p,"Power dissipated in each bulb in Watt = ");
     //displaying result
```

Chapter 14

Magnetism

Scilab code Exa 14.8 8

```
clc;
K=2*10^-7;          //constant in N/A square
I=100;              //current in Ampere
s=5;                //distance in m
B=(K*I)/s;         //calculating magnitude of field
disp(B,"Magnitude of field in Tesla = ");     //
   displaying result
```

Scilab code Exa 14.10 10

```
clc;
K=2*10^-7;          //constant in N/A square
I=8;              //current in Ampere
s=5*10^-2;                //distance in m
B=(K*I)/s;         //calculating magnitude of field
disp(B,"Magnitude of field in Tesla = ");     //
   displaying result
disp(2*B,"Total field in Tesla = ");   //displaying
   result
```

Scilab code Exa 14.11 11

```
clc;
K=2*10^-7;          //constant in N/A square
N=100;             //number of turns
I=4;              //current in Ampere
r=5*10^-2;                 //radius in m
B=(%pi*K*I*N)/s;          //calculating magnitude of
    field
disp(B,"Magnitude of field in Tesla = ");     //
    displaying result
```

Scilab code Exa 14.12 12

```
clc;
K=2*10^-7;          //constant in N/A square
N=1000;             //number of turns
B=2.5*10^-5;        //field in Tesla
l=0.2;                //length in m
I=(B*l)/(2*%pi*K*N);          //calculating magnitude
    of field
disp(I,"Current in Ampere = ");     //displaying
    result
```

Scilab code Exa 14.13 13

```
clc;
I=5;          //current in Ampere
L=0.01;       //length in m
```

```
4 B=0.8;        //magnitude of field in Tesla
5 F=B*I*L;      //calculating force
6 disp(F,"Force in Newton = ");      //displaying
    result
```

Scilab code Exa 14.14 14

```
1 clc;
2 P=2000;      //power in Watt
3 V=120;       //potential diff in volt
4 I=P/V;       //current in Ampere
5 s=2*10^-3;    //distance in m
6 K=2*10^-7;    //constant in N/A square
7 F=(I*I*K)/s;     //calculating force per metre
8 disp(F,"Force in Newton per metre in opposite
    direction = ");    //displaying result
```

Chapter 15

Electromagnetic Induction

Scilab code Exa 15.3 3

```
1 clc;
2 l=5*0.305;      //converting ft to metre
3 v=40*0.447;     //converting mile/hr to m/sec
4 B=3*10^-5;      //magnetic field in Tesla
5 ve=B*l*v;        //calculating potential difference
6 disp(ve,"Potential difference in Volt = ");    //
    diplaying result
```

Scilab code Exa 15.4 4

```
1 clc;
2 i=0.707*10;     //current in Ampere
3 r=20;           //resistance in Ohm
4 p=i*i*r;        //calculating power dissipated
5 disp(p,"Power dissipated in Watt = ");    //
    diplaying result
```

Scilab code Exa 15.5 5

```
clc;
r=5;              //resistance in ohm
p=1000;           //power in Watt
va=100;           //potential diff in Volt for a
vb=100000;       //potential diff in volt for b
ia=p/va;         //calculating current
ib=p/vb;         //calculating current
ha=ia*ia*r;      //heat in Watt
hb=ib*ib*r;      //heat in Watt
disp(ha,"Heat produced by a in Watt = ");      //
   diplaying result
disp(hb,"Heat produced by b in Watt = ");    //
   diplaying result
```

Scilab code Exa 15.6 6

```
clc;
i1=3;       //current in Ampere
n2=500;     //no. of turns
n1=100;     //no. of turns
v1=120;     //potential diff in volt
v2=(n2*v1)/n1;       //calculating v2
i2=(n1*i1)/n2;       //calculating i2
disp(v2,"Voltage in volt = ");    //diplaying result
disp(i2,"Current in Ampere = ");  //diplaying result
```

Scilab code Exa 15.7 7

```
clc;
p=10000;     //power in Watt
v1=5000;     //potential diff in volt
```

```
4 v2=240;      //voltage in volt
5 i2=p/v2;      //calculating i2
6 disp(v1/v2,"Ratio of turns = ");    //diplaying
     result
7 disp(i2,"Maximum current in Ampere = ");  //
     diplaying result
```

Scilab code Exa 15.8 8

```
1 clc;
2 r=100;            //resistance in ohm
3 v1=120;          //potential diff in Volt
4 n2=50;           //no. of turns
5 n1=200;          //no. of turns
6 v2=(n2*v1)/n1;     //potential diff in volt
7 i2=v2/r;       //calculating current
8 i1=(n2/n1)*i2;       //calculating current
9 disp(i1,"Current in primary circuit in Ampere = ");
      //diplaying result
```

Chapter 16

Waves

Scilab code Exa 16.9 9

```
clc;
l=10^-4;      //lambda in m
v=0.25;       //velocity in m/sec
f=v/l;        //calculating frequency
disp(f,"Frequency in Hz = ");     //diplaying result
```

Scilab code Exa 16.10 10

```
clc;
v=5020;       //velocity in ft/sec
f=256;        //frequency in Hz
l=v/f;         //calculatin lamda
disp(l,"Wavelength in ft = ");     //diplaying result
```

Scilab code Exa 16.11 11

```
clc;
f=1/4;        //frequency in Hz
l=30;          //wavwlength in metre
v=f*l;         //calculating velocity
disp(v,"Velocity in m/sec = ");     //diplaying
   result
```

Scilab code Exa 16.12 12

```
clc;
l=3.2*10^-2;     //lambda in m
v=3*10^8;       //velocity in m/sec
f=v/l;        //calculating frequency
disp(f,"Frequency in Hz = ");     //diplaying result
```

Scilab code Exa 16.13 13

```
clc;
c=3*10^8;       //velocity in m/sec
n=2.42;        //refractive index
v=c/n;         //calculating velocity
disp(v,"Velocity in m/sec = ");     //diplaying
   result
```

Scilab code Exa 16.15 15

```
clc;
v=343;       //velocity in m/sec
vs=20;       //velocity in m/sec
fs=500;      //original frquency
```

```
5 f1=(fs*v)/(v-vs);    //doppler effect
6 disp(f1,"Percieved frequency in Hz = ");    //
    diplaying result
```

Scilab code Exa 16.16 16

```
1 clc;
2 v1=-20;      //velocity in m/sec
3 vs=0;      //velocity in m/sec
4 fs=500;     //original frquency
5 f1=(fs*(v+v1))/(v-vs);    //doppler effect
6 disp(f1,"Percieved frequency in Hz = ");    //
    diplaying result
```

Scilab code Exa 16.17 17

```
1 clc;
2 v=343;      //velocity in m/sec
3 fs=800;     //original frquency
4 f1=750;    //percieved frquency
5 vs=v*(1-(fs/f1)); //calculating velocity
6 disp(vs,"Trains velocity in m/sec = ");    //
    diplaying result
```

Scilab code Exa 16.18 18

```
1 clc;
2 l=0.1;       //l=(v/c)
3 f=sqrt((1-l)/(1+l));      //ratio of frquencies f=(f/
    fs)
4 disp(f*100,"Percent shift = ");    //diplaying result
```

Chapter 17

Lenses

Scilab code Exa 17.3 3

```
clc;
p=24;       //in inch
f=16;       //inch
q=(p*f)/(p-f);      //calculating image distance
disp(q,"Distance of image in inch = ");     //
   displaying result
h=3;       //inch
hd=(-h*q)/p;      //calculating diameter
disp(hd,"Diameter in inch = ");    //displaying
   result
```

Scilab code Exa 17.4 4

```
clc;
p=30;       //in cm
f=15;       //in cm
q=(p*f)/(p-f);      //calculating image distance
disp(q,"Distance of image in cm = ");     //
   displaying result
```

```
6 h=8;       //in cm
7 hd=(-h*q)/p;      //calculating diameter
8 disp(hd,"Diameter in cm = ");    //displaying result
```

Scilab code Exa 17.5 5

```
1 clc;
2 p=100;       //in cm
3 f=40;       //in cm
4 q=(p*f)/(p-f);      //calculating image distance
5 disp(q,"Distance of image in cm = ");     //
    displaying result
6 h=6;       //in cm
7 hd=(-h*q)/p;      //calculating diameter
8 disp(hd,"Diameter in cm = ");    //displaying result
```

Scilab code Exa 17.6 6

```
1 clc;
2 p=12;       //in ft
3 f=-2;       //in ft
4 q=(p*f)/(p-f);      //calculating image distance
5 disp(q,"Distance of image in ft = ");     //
    displaying result
6 m=-q/p;       //calculating magnification
7 disp(m,"Magnification = ");    //displaying result
```

Scilab code Exa 17.7 7

```
1 clc;
```

```
2 hd=5;      //in mm
3 h=2;       //in mm
4 f=6;       //in cm
5 m=hd/h;    //calculating magnification
6 p=((m-1)/m)*f;        //lens formula
7 disp(p,"Distance in cm = ");    //displaying result
8 q=-m*p;       //lens formula
9 disp(q,"Image distance in cm = ");    //displaying
    result
```

Scilab code Exa 17.8 8

```
1 clc;
2 p=1.5;       //in inch
3 m=3;       //magnification
4 q=-m*p;      //calculating image distance
5 disp(q,"Distance of image in inch = ");     //
    displaying result
6 f=(p*q)/(p+q);       //calculating focal length
7 disp(f,"Focal Length in inch = ");    //displaying
    result
```

Scilab code Exa 17.9 9

```
1 clc;
2 p=1.5;       //in inch
3 f=0.15;         //in metre
4 w=(p*f)/(p-f);       //calculating focal length
5 disp(w*10^3,"Length in mm = ");    //displaying
    result
```

Scilab code Exa 17.10 10

```
clc;
hd=-36;     //in inch
h=2;        // in inch
m=hd/h;     //calculating magnification
q=-15;     //in ft
p=-q/m;       //in ft
f=(p*q)/(p+q);      //calculating focal length
disp(f,"Focal Length in ft = ");     //displaying
   result
```

Scilab code Exa 17.11 11

```
clc;
f1=10;      //in cm
f2=-20;     //in cm
f=(f1*f2)/(f1+f2);    //calculating focal length
disp(f,"Focal length of the combination in cm = ");
      //displaying result
```

Chapter 18

Quantum Physics

Scilab code Exa 18.1 1

```
clc;
f=5*10^14;      //frequency in Hz (given)
h=6.63*10^-34;  //planck's constant in J.sec
E=h*f;          //calculating energy
disp(3*E,"Total Energy in Joule = ");    //
   displaying reuslt
```

Scilab code Exa 18.2 2

```
clc;
c=3*10^8;       //velocity in m/sec
l=5.5*10^-7;    //wavelength in m
f=c/l;          //calculating frequency
disp(f,"Frequency in Hz = ");    //displaying reuslt
h=6.63*10^-34;  //planck's constant in J.sec
E=h*f;          //calculating energy
disp(E,"Energy in Joule = ");    //displaying reuslt
disp((100/E),"No. of photons emitted per second = ")
   ;  //displaying result
```

Scilab code Exa 18.3 3

```
clc;
m=9.1*10^-31;      //mass of electron in kg
v=10^7;            //velocity in m/sec
KE=(1/2)*m*v*v;    //calculating kinetic energy in
   Joule
disp(KE,"Kinetic energy in Joule = ");  //displaying
    result
disp(KE/(1.6*10^-19),"Kinetic energy in eV = ");  //
   displaying result
```

Scilab code Exa 18.4 4

```
clc;
e=1.6*10^-19;       //charge
ke=200;             //kinetic energy in eV
KE=ke*e;          //calculating kinetic energy
m=1.67*10^-27;       //mass in kg
disp(KE,"Kinetic Energy in Joule = ");     //
   displaying result
v=sqrt((2*KE)/m);         //calculating velocity
disp(v,"Velocity in m/sec = ");      //displaying
   result
```

Scilab code Exa 18.5 5

```
clc;
e=1.6*10^-19;       //charge
```

```
3 c=3*10^8;          //velocity in m/sec
4 ke=106*10^6;             //kinetic energy in eV
5 KE=ke*e;          //calculating kinetic energy
6 disp(KE,"Kinetic Energy in Joule = ");      //
    displaying result
7 m=KE/(c*c);         //Einstein's equation
8 disp(m,"Mass in kg = ");       //displaying result
9 disp(m/(9.1*10^-31),"Times electron mass = ");  //
    displaying result
```

Scilab code Exa 18.6 6

```
1 clc;
2 e=1.6*10^-19;       //charge
3 c=3*10^8;          //velocity in m/sec
4 KE=1.6*10^-19;           //change in energy
5 m=KE/(c*c);         //Einstein's equation
6 disp(m,"Mass in kg = ");       //displaying result
7 disp(m/(3*10^-26),"Times mass of H20 molecule = ");
    //displaying result
```

Scilab code Exa 18.7 7

```
1 clc;
2 c=3*10^8;       //velocity in m/sec
3 l=5*10^-7;     //wavelength in m
4 f=c/l;           //calculating frequency
5 disp(f,"Frequency in Hz = ");     //displaying reuslt
6 h=6.63*10^-34;  //planck's constant in J.sec
7 E=h*f;          //calculating energy
8 disp(E,"Energy in Joule = ");     //displaying reuslt
9 disp(E/(1.6*10^-19),"(a)Max. energy of photons that
    emerge = ");  //displaying result
```

Scilab code Exa 18.8 8

```
clc;
h=6.63*10^-34;  //planck's constant in J.sec
e=1.6*10^-19;   //in Coloumb
V=10^4;         //potential difference in Volt
f=(e*V)/h;          //calculating frequency
disp(f,"Frequency in Hz = ");    //displaying reuslt
```

Scilab code Exa 18.9 9

```
clc;
c=3*10^8;       //velocity in m/sec
l=2*10^-11;     //wavelength in m
f=c/l;           //calculating frequency
e=1.6*10^-19;   //in Coloumb
disp(f,"Frequency in Hz = ");    //displaying reuslt
h=6.63*10^-34;  //planck's constant in J.sec
V=(h*f)/e;          //calculating energy
disp(V,"operating Voltage in Volt = ");    //
   displaying reuslt
```

Scilab code Exa 18.10 10

```
clc;
m=10^3;       //mass in kg
v=20;         //velocity in m/sec
h=6.63*10^-34;  //planck's constant in J.sec
l=h/(m*v);          //calculating energy
```

```
6 disp(l,"Wavelength in m = ");     //displaying reuslt
```

Scilab code Exa 18.11 11

```
1  clc;
2  e=1.6*10^-19;       //charge
3  ke=1.5*10^4;              //kinetic energy in eV
4  KE=ke*e;          //calculating kinetic energy
5  m=9.1*10^-31;       //mass in kg
6  disp(KE,"Kinetic Energy in Joule = ");      //
     displaying result
7  v=sqrt((2*KE)/m);         //calculating velocity
8  disp(v,"Velocity in m/sec = ");       //displaying
     result
9  l=h/(m*v);     //calculating wavelength
10 disp(l,"Wavelength in metre = ");     h=6.63*10^-34;
       //planck's constant in J.sec
```

Scilab code Exa 18.13 13

```
1  clc;
2  h=6.63*10^-34;      //planck's constant in J.sec
3  delx=10^-9;         //in m
4  m=9.1*10^-31;       //mass in kg
5  u=h/(2*%pi*delx);   //uncertainty principle
6  disp(u,"Uncertainty in electrons momentum in kg.m/
     sec");  //displaying result
7  delv=u/m;      //uncertainty principle
8  disp(delv,"Uncertainty in electrons velocity in m/
     sec");  //displaying result
9  disp(u*1,"Uncertainty in electrons position in m");
      //displaying result
```

Scilab code Exa 18.14 14

```
clc;
h=6.63*10^-34;      //planck's constant in J.sec
delx=10^-10;         //in m
m=9.1*10^-31;       //mass in kg
u=h/(2*%pi*delx);   //uncertainty principle
disp(u,"Uncertainty in electrons momentum in kg.m/
   sec = ");  //displaying result
KE=(1/(2*m))*(u*u); //uncertainty principle
disp(KE,"Uncertainty in electrons kinetic energy in
   Joule = ");  //displaying result
```

Chapter 19

The Nucleus

Scilab code Exa 19.4 4

```
clc;
disp(((0.7552*34.969)+(0.2447*36.966)),"Atomic mass
    of chlorine = ");  //displaying result
```

Scilab code Exa 19.5 5

```
clc;
delm=(8.0626+8.0693)-15.9949;     //in u
E=delm*931;      //calculating binding energy in MeV
disp(E,"Binding Energy in MeV = ");     //displaying
    result
```

Scilab code Exa 19.6 6

```
clc;
m0=10.07825+10.08665; //in u
```

```
3 delm=160.6/931;    //calculating mass eqvi. of 160.6
    MeV
4 disp((m0-delm),"Atomic Mass in u = ");  //displaying
    result
```

Scilab code Exa 19.10 10

```
1 clc;
2 m=0.001;       //mass in kg
3 c=3*10^8;      //velocity in m/sec
4 p=10^8;        //power in Watt
5 t=24;          //time in hr/day
6 E=m*c*c;       //Eintstein equation
7 disp(E,"Energy in Joule = ");  //displaying result
8 M=(p*3600*t)/E;     //calculating mass of U required
9 m=E/(7822*4185);    //calculating mass of coal
    required
10 disp(M,"Mass of U required in kg/day = ");  //
    displaying result
11 disp(m,"Mass of coal required in kg/day = ");  //
    displaying result
```

Chapter 21

Theory of The Atom

Scilab code Exa 21.5 5

```
1 clc;
2 e1=-13.6;    //in eV
3 disp((e1/4),"Energy of first excited state in eV = "
    ); //displaying result
4 disp((e1/9),"Energy of second excited state in eV =
    "); //displaying result
5 disp((e1/16),"Energy of third excited state in eV =
    "); //displaying result
```

Scilab code Exa 21.6 6

```
1 clc;
2 h=6.63*10^-34;        //Plancks constant in J.sec
3 m=9.1*10^-31;         //mass in kg
4 r1=5.3*10^-11;        //radius in m
5 v=h/(2*%pi*m*r1);     //calculating velocity in m/sec
6 disp(v,"Velocity in m/sec = "); //displaying result
```

Scilab code Exa 21.7 7

```
clc;
E=2.18*10^-18;        //energy in Joule
k=1.38*10^-23;        //constant in J/K
disp(((2*E)/(3*k)),"Temperature in Kelvin = ");  //
   displaying result
```

Scilab code Exa 21.8 8

```
clc;
E=2.18*10^-18;        //energy in Joule
k=1.38*10^-23;        //constant in J/K
disp(E/h,"Frequency in Hz = ");  //displaying result
```

Scilab code Exa 21.11 11

```
clc;
e1=-13.6;     //energy in eV
disp(e1/9,"Energy in eV = ");  //displaying result
```

Chapter 25

Stoichiometry

Scilab code Exa 25.2 2

```
clc;
a=238.03;      //atomic mass
m=75;          //no. of moles
mass=m*a;    //calculating mass of U
n=6.023*10^23;     //avogadro's no.
no=m*n;          //calculating no. of atoms
disp(mass,"Mass of U in gram = ");       //displaying
    result
disp(no,"No. of atoms = ");      //displaying result
```

Scilab code Exa 25.3 3

```
clc;
a=63.54;      //atomic mass of Cu
m=100;          //mass of Cu
moles=m/a;    //calculating moles of U
n=6.023*10^23;     //avogadro's no.
no=moles*n;          //calculating no. of atoms
```

```
7 disp(moles,"Maoles of U = ");       //displaying
    result
8 disp(no,"No. of atoms = ");      //displaying result
```

Scilab code Exa 25.4 4

```
1 clc;
2 no=10^24;      //no of atoms
3 n=6.023*10^23;     //avogadro's no.
4 moles=no/n;         //calculating no. of moles
5 disp(moles,"Moles = ");       //displaying result
```

Scilab code Exa 25.5 5

```
1 clc;
2 c=12.01;    //mass of carbon
3 h=1.008;   //mass of hydrogen
4 mass=((2*c)+(4*h))*9.4;      //calculating mass
5 disp(mass,"Required mass = ");  //displaying result
6 n=6.023*10^23;       //avogadro's no
7 ac=(2*9.4)*n;       //calculating atoms of c
8 disp(ac,"Atoms of C = "); //displaying result
```

Scilab code Exa 25.6 6

```
1 clc;
2 c=12.01;    //mass of carbon
3 h=1.008;   //mass of hydrogen
4 o=16.00;   //mass of oxygen
```

```
5 mass=((6*c)+(12*h)+(6*o));      //calculating formula
      mass
6 m=500*454;          //mass of glucose in g
7 moles=m/mass;  //moles
8 disp(moles,"Moles = ");  //displaying result
```

Scilab code Exa 25.7 7

```
1 clc;
2 pb=207.19;    //mass of carbon
3 n=14.01;  //mass of hydrogen
4 o=16.00;  //mass of oxygen
5 mass=((1*pb)+(2*n)+(6*o));      //calculating formula
      mass
6 m=28.02;          //no. of grams per mole
7 moles=m/mass;  //moles
8 disp(moles*100,"Proportion in percentage = ");  //
    displaying result
```

Scilab code Exa 25.8 8

```
1 clc;
2 m=50;      //mass of N in g
3 a=22.99; //atomic mass in g/mole
4 mole=m/a;  //moles of Na
5 ac=35.46;  //atomic mass of chlorine
6 n=2.17;      //no. of moles
7 mass=n*ac;  //mass of Cl
8 disp(mole,"Moles of Na = ");  //displaying result
9 disp(mass,"Mass oc Cl = ");   //displaying result
10 ps=m/127;  //proportion of sodium
11 pc=mass/127;  //proportion of chlorine
```

```
12 disp(ps*100,"Proportion of Sodium = ");  //
   displaying result
13 disp(pc*100,"Proportion of Chlorine = ");  //
   displaying result
```

Scilab code Exa 25.9 9

```
1  clc;
2  m=70;  //mass in g
3  a=14.01;  //atomic mass
4  moles=m/a;  //moles
5  h=1.008;  //atomic mass of hydrogen
6  mass=3*moles*h;  //mass of H
7  disp(moles,"Moles of N = ");  //displaying result
8  disp(mass,"Mass of H = ");  //displaying result
9  ma=15+70;  //mass of ammonia
10 disp((mass/ma)*100,"Proportion of Hydrogen = ");  //
   displaying result
11 disp((m/ma)*100,"Proportion of Nitrogen = ");  //
   displaying result
```

Scilab code Exa 25.10 10

```
1 clc;
2 m=200;  //mass in g
3 o=16.00;  //atomic mass
4 moles=m/o;  //moles
5 m=6.25;     //moles of S
6 as=32.06;      //atomic mass of s
7 disp(m*as,"Mass of S = ");  //displaying result
```

Scilab code Exa 25.11 11

```
clc;
c=12.01;    //mass of carbon
h=1.008;   //mass of hydrogen
mass=((2*c)+(2*h));      //calculating mass
o=16.00;       //mass of oxygen
moles=200/mass;       //moles
mo=2*o*19.20;   //mass of O2
disp(mo,"Mass of O2 in g= ");  //displaying result
mc=((2*o)+c)*15.36;   //mass of CO2;
disp(mc,"Mass of CO2 in g= ");  //displaying result
```

Scilab code Exa 25.12 12

```
clc;
m=1000;   //mass of H2
fh=2.02;   //formula mass of hydrogen
fo=32.00;   //formula mass of oxygen
disp((m/fh),"Moles of H2 = ");   //displaying result
disp((m/fo),"MOles of O2 = ");   //displaying result
mass=62.5*18.02;   //mass
disp(mass,"Mass of H2O = ");   //displaying result
disp(432.5*2.02,"Mass of H2 = ");   //displaying
    result
```

Scilab code Exa 25.13 13

```
clc;
Na=22.99;    //mass of Na
S=32.06;   //mass of S
O=16.00;    //mass of O
mass=((2*Na)+(1*S)+(4*O));      //calculating mass
```

```
6 m=100/mass; //moles
7 disp(m,"Moles = "); //displaying result
8 disp(m*32.06,"Mass of S = "); //displaying result
9 disp(22.99*1.408,"Mass of Na = "); //displaying
    result
```

Scilab code Exa 25.15 15

```
1 clc;
2 disp(128.8/32.06,"Moles of S = "); //displaying
    result
3 disp(8.06/1.008,"Moles of H = "); //displaying
    result
```

Scilab code Exa 25.16 16

```
1 clc;
2 disp(57.54/79.91,"Moles of Br = "); //displaying
    result
3 disp(17.29/12.01,"Moles of C = "); //displaying
    result
4 disp(3.63/1.008,"Moles of H = "); //displaying
    result
```

Scilab code Exa 25.17 17

```
1 clc;
2 disp(100.9/12.01,"Moles of C = "); //displaying
    result
3 disp(22.6/1.008,"Moles of H = "); //displaying
    result
```

Chapter 26

Solutions

Scilab code Exa 26.1 1

```
1 clc;
2 disp((3/2)*100,"Volume of O2 = ");    //displaying
     result
```

Scilab code Exa 26.2 2

```
1 clc;
2 disp(200/122.56,"Moles = ");    //displaying result
3 disp(2.45*22.4,"Volume = ");      //displaying result
```

Scilab code Exa 26.3 3

```
1 clc;
2 disp(2/22.4,"Moles = ");    //displaying result
3 disp(0.179*84,"Mass = ");      //displaying result
```

Scilab code Exa 26.4 4

```
clc;
p=1;        //atm
v=1000;       //volume in litres
t=673;       //Kelvin
R=0.0821;      //constant in atm-l/mole-K
n=(p*v)/(R*t);  //calculating n
disp(n,"n = ");  //displaying result
disp(6.03*159.7,"Mass = ");  //displaying result
disp(12.1*55.85,"Mass of Fe = ");    //displaying
   result
```

Scilab code Exa 26.5 5

```
clc;
N=14.01;  //mass of N
H=1.008;  //mass of H
m=N+(3*H);       //calculating mass
moles=1/m      //cal moles
v=moles*22.4;       //cal vol
disp(v,"Volume = ");  //displaying result
disp((1*1.32*373)/(1.2*273),"V2 = ");    //
   displaying result
```

Scilab code Exa 26.6 6

```
clc;
p=4;        //atm
```

```
3 v=40;       //volume in litres
4 t=773;       //Kelvin
5 R=0.0821;      //constant in atm-l/mole-K
6 n=(p*v)/(R*t);  //calculating n
7 disp(n,"n = ");  //displaying result
8 u=238.03;    //mass of U
9 f=19.00;  //mass of F
10 m=u+(6*f);  //cal mass
11 disp(m*2.52,"Mass = ");  //displaying result
```

Scilab code Exa 26.7 7

```
1 clc;
2 p=0.263*10^5;       //Pascal
3 v=120;       //volume in m cube
4 t=223;       //Kelvin
5 R=8.31;      //constant
6 n=(p*v)/(R*t);  //calculating n
7 disp(n,"n = ");  //displaying result
8 m=n*4;       //cal mass of He
9 disp(m,"Mass of He = ");  //displaying result
```

Scilab code Exa 27.7 7

```
1 clc;
2 disp(0.075*111,"Mass = "); //displaying result
```

Scilab code Exa 26.8 8

```
1 clc;
```

```
2 c=12.01;
3 h=1.008;
4 v=22.4;     //vol
5 m=(2*c)+(4*h);  //cal mass
6 d=m/v;  //cal density
7 disp(d,"Density in g/litre = ");  //displaying
    result
```

Scilab code Exa 26.9 9

```
1 clc;
2 p=5;       //atm
3 v=1;       //volume in litres
4 t=293;       //Kelvin
5 R=0.0821;      //constant in atm-l/mole-K
6 n=(p*v)/(R*t);  //calculating n
7 disp(n,"n = ");  //displaying result
8 m=n*32;  //moles of O2
9 disp(m,"Moles of O2 = "); //displaying result
10 d=m/v;     //cal density
11 disp(d,"Density in g/litre = ");  //displaying
    result
```

Scilab code Exa 26.10 10

```
1 clc;
2 disp(28.1/0.214,"Molecular mass = ")     //displaying
    result
```

Chapter 27

Solutions

Scilab code Exa 27.3 3

```
1 clc;
2 f=(137.34)+(70.92);  //cal formula mass
3 disp(f,"Formula mass = ");  //displaying result
4 disp((75/f),"Moles = ");  (137.34)+(2*70.92)
```

Scilab code Exa 27.4 4

```
1 clc;
2 disp(2*0.12,"Moles = "); //displaying result
```

Scilab code Exa 27.5 5

```
1 clc;
2 disp(0.082/2,"Litres = "); //displaying result
```

Scilab code Exa 27.6 6

```
1 clc;
2 disp(2*170,"Mass = "); //displaying result
```

Scilab code Exa 27.8 8

```
1 clc;
2 disp(4/166,"Moles = "); //displaying result
3 disp(0.024/0.8,"Litres = "); //displaying result
```

Scilab code Exa 27.9 9

```
1 clc;
2 m=12.01+32.00;  //cal mass
3 disp(3.3/m,"Moles = "); //displaying result
```

Scilab code Exa 27.11 11

```
1 clc;
2 disp(20/180,"Moles = "); //displaying result
3 disp(0.11/0.05,"Molality = ");  //displaying result
```

Scilab code Exa 27.12 12

```
clc;
m=24.02+6.05+32.00;    //cal mass
disp(m*13.4,"Mass = "); //displaying result
```

Scilab code Exa 27.14 14

```
clc;
m=0.91/0.52;    //cal molality
disp(m*0.5,"Moles = "); //displaying result
disp(300/(m*0.5),"Molecular Mass = ");  //displaying
    result
```

Chapter 28

Acids and Bases

Scilab code Exa 28.1 1

```
clc;
disp(1000/18,"Moles of H2O = ");  //displaying
    result
```

Scilab code Exa 28.10 10

```
clc;
disp(2*0.4,"Moles of KOH = ");  //displaying result
disp(0.8*(1.01+16.00+39.10),"Mass = ");  //
    displaying result
```

Scilab code Exa 28.11 11

```
clc;
disp(3*5,"Moles = ");  //displaying result
```

```
3 disp(15*(2.02+32.06+64),"Mass = "); //displaying
    result
```

Scilab code Exa 28.12 12

```
1 clc;
2 disp((2*50)/10,"Volume = "); //displaying result
```

Chapter 30

Electrochemistry

Scilab code Exa 30.3 3

```
clc;
F=96500/3600;     //calculating 1F
disp(F,"1 Faraday in ampere.hr = ");  //displaying
   result
```

Scilab code Exa 30.4 4

```
clc;
i=12;       //current in Ampere
t=7200;     //time in sec
A=65.37;    //molar mass of zinc
F=96500;      //in Coloumb
v=2;        //valency
m=(i*t*A)/(F*v);  //calculating mass
disp(m,"Mass in gm = ");  //displaying result
```

Scilab code Exa 30.5 5

```
clc;
i=20;       //current in Ampere
A=112.4;    //molar mass of cadmium
F=96500;      //in Coloumb
v=2;        //valency
m=50;        //mass in gm
t=(m*F*v)/(i*A);  //calculating time
disp(t,"Time in sec = ");  //displaying result
```

Scilab code Exa 30.6 6

```
clc;
t=600;       //time in sec
i=100;       //current in Ampere
A=26.98;    //molar mass of aluminium
F=96500;      //in Coloumb
m=5.6;       //mass in gm
v=(i*t*A)/(F*m);  //calculating valency
disp(v,"Valency = ");  //displaying result
```

Scilab code Exa 30.7 7

```
clc;
d=8.9;      //density of copper in gm/cm cube
V=6000*0.002;       //volume in cm cube
m=d*V;               //calculating mass in gm
i=100;       //current in Ampere
A=63.54;    //molar mass of copper
F=96500;      //in Coloumb
v=2;        //valency
t=(m*F*v)/(i*A);  //calculating time
```

```
10 disp(t,"Time in sec = ");  //displaying result
```

Scilab code Exa 30.8 8

```
1 clc;
2 i=50;       //current in Ampere
3 t=3600;     //time in sec
4 A=22.99;    //molar mass of zinc
5 F=96500;      //in Coloumb
6 v=1;        //valency
7 m=(i*t*A)/(F*v);  //calculating mass
8 disp(m,"Mass in gm = ");  //displaying result
9 M=(i*t)/(F*v);   //calculating moles
10 disp(M,"No. of moles per hour = ");  //displaying
    result
```

Scilab code Exa 30.9 9

```
1 clc;
2 i=10;       //current in Ampere
3 t=3600;     //time in sec
4 F=96500;      //in Coloumb
5 v=1;        //valency
6 M=(i*t)/(F*v);   //calculating moles
7 disp(M,"No. of moles per hour = ");  //displaying
    result
```

Scilab code Exa 30.10 10

```
1 clc;
```

```
2 A=107.87;          //atomic mass in gm
3 F=96500;           //in Coloumb
4 v=1;              //valency
5 z=A/(F*v);         //calculating ECE using Faraday's
    Law
6 disp(z,"(a)Electrochemical Eqvivalent = ");  //
    displaying result
7 A1=16;           //atomic mass in gm
8 v1=2;            //valency
9 z1=A1/(F*v1);     //Faraday's Law
10 disp(z1,"(b)Electrochemical Equivalent = ");  //
    displaying result
```

Scilab code Exa 30.11 11

```
1 clc;
2 z=0.405;           //ECE in mg/C
3 i=25;              //current in Ampere
4 t=1200;            //time in sec
5 m=z*i*t;           //calculating mass
6 disp(m,"Mass in gm = ");  //displaying result
7 m1=10^6;           //mass
8 t=m1/(z*i);         //calculating time
9 disp(t,"Time in sec = ");  //displaying result
```

Scilab code Exa 30.13 13

```
1 clc;
2 Q=200;       //charge in Coloumb
3 A=65.37;     //molar mass of zinc
4 F=96500;     //in Coloumb
5 v=2;         //valency
6 m=(Q*A)/(F*v);  //calculating mass
```

```
7 disp(m,"Mass in gm = ");  //displaying result
```

Chapter 34

The Atmosphere

Scilab code Exa 34.8 8

```
1 clc;
2 m=1;       //mass in kg
3 delt=80;   //change in temperature in celcius
4 c=1;       //specific heat in kcal/kg.celcius
5 Q=m*c*delt;     //calculating heat
6 disp(Q,"Heat required in kcal = "); //displaying
    result
7 t=Q/9.4;      //calculating time
8 disp(t,"Time required in second = "); //displaying
    result
```

Chapter 40

The Earths Interior

Scilab code Exa 40.7 7

```
1 clc;
2 r=6.4*10^6;    //radius in metre
3 v=(4/3)*%pi*r*r*r;  //calculating volume
4 m=6.0*10^24;      //mass in kg
5 d=m/v;      //calculating density
6 disp(d,"Density in kg/m cube = ");  //displaying
    result
```