```
(*Ne-Atom and homologues 1s(2)2s(2) 2p(6), all p equal size, with
exchange correction page 40; 25.12.2012*)
```

In[97]:=
```
Clear[z, sig]; sig = 0.24;
T = 9 / (4 * P^2) + 9 * 4 / (4 * Q^2) + 12 / R^2;
Vne = -3 * z / P - 3 * z / Q - 6 * z / R;
Vee = (2 / Q) * (3 - (6 / 10) * (P / Q) ^2) - 6 * sig * P^2 / Q^3 + 3 * sig / P + 3 * sig / Q +
   12 * (1 - (3 / 20) * (P / R) ^2 + (1 / 32) * (P / R) ^3) / R + 4.5 * sig / R + 12 *
    (1 - (3 / 20) * (Q / R) ^2 + (1 / 32) * (Q / R) ^3) / R + 6.582336 / R; (* 8.48528/R *)
func = T + Vne + Vee; Vir = (Vne + Vee) / T;
(* Etot, P, Q *)
t = Table[FindMinimum[func, {P, 0.15}, {Q, 1.6},
   {R, 0.6}, {MaxIterations → 800}, {Method → "Newton"}], {z, 10, 18}]
```

Out[102]=
```
{{-129.905, {P → 0.153984, Q → 1.58851, R → 0.617736}},
 {-162.975, {P → 0.139692, Q → 1.29138, R → 0.53278}},
 {-200.046, {P → 0.127825, Q → 1.02443, R → 0.472439}},
 {-241.219, {P → 0.117818, Q → 0.749778, R → 0.436024}},
 {-286.455, {P → 0.109262, Q → 0.646637, R → 0.396166}},
 {-335.699, {P → 0.101862, Q → 0.577265, R → 0.36147}},
 {-388.949, {P → 0.095399, Q → 0.523531, R → 0.331974}},
 {-446.201, {P → 0.0897063, Q → 0.479798, R → 0.306779}},
 {-507.455, {P → 0.0846538, Q → 0.44321, R → 0.285068}}}
```

In[103]:=
```
(* Virial ratio *)
```

In[104]:=
```
Table[N[Vir /. t[[z - 9, 2]], 10], {z, 10, 18}]
Table[N[Vne /. t[[z - 9, 2]], 10], {z, 10, 18}]
Table[N[Vee /. t[[z - 9, 2]], 10], {z, 10, 18}]
```

Out[104]=
```
{-2., -2., -2., -2., -2., -2., -2., -2., -2.}
```

Out[105]=
```
{-310.84, -385.667, -469.178, -561.923,
 -661.382, -768.712, -884.014, -1007.3, -1138.59}
```

Out[106]=
```
{51.0286, 59.7171, 69.0864, 79.4845, 88.4729, 97.3135, 106.116, 114.902, 123.678}
```

In[107]:=
```
(* Etot in eV *)
```

In[108]:=
```
Table[N[t[[i, 1]] * 27.21138, 10], {i, 1, 9}];
PA = Table[P /. t[[i, 2]], {i, 1, 9}];
QA = Table[Q /. t[[i, 2]], {i, 1, 9}];
RA = Table[R /. t[[i, 2]], {i, 1, 9}];
```

In[112]:=
```
Table[
 Show[Graphics[{{Thickness[0.01],
   {RGBColor[1, 0, 0],
      Circle[{0, -RA[[i]]}, RA[[i]]], Circle[{0, RA[[i]]}, RA[[i]]]},
   {RGBColor[1, 0, 1], Circle[{-RA[[i]], 0}, RA[[i]]], Circle[{RA[[i]], 0},
   RA[[i]]]}, {RGBColor[0, 1, 1], Circle[{0, 0}, RA[[i]]]}}, {Thickness[0.015],
     {RGBColor[0, 0, 0], Circle[{0, 0}, PA[[i]]], Circle[{0, 0}, QA[[i]]]}}],
   {AspectRatio -> Automatic,
  Axes -> True, GridLines -> Automatic, ColorOutput → Automatic,
  PlotRange -> {{-1.6, 1.6}, {-1.6, 1.6}}, Frame -> True}], {i, 1, 9}]
```

Out[112]=