# Content

[Content 0](#_Toc62403408)

[Examples 0](#_Toc62403409)

[Ideal gas law 1](#_Toc62403410)

[Ideal gas processes 1](#_Toc62403411)

[Ideal gas work 2](#_Toc62403412)

[Isothermal process 3](#_Toc62403413)

[Carnot cycle 3](#_Toc62403414)

[Immersed object in center 4](#_Toc62403415)

[Distance and displacement 4](#_Toc62403416)

[Ray source and direction 5](#_Toc62403417)

[Angle of reflection 5](#_Toc62403418)

[Single ray many spheres 5](#_Toc62403419)

[quadratic formula 8](#_Toc62403420)

[coulomb force def 8](#_Toc62403421)

[electrostatic force *qiqj* > 0 8](#_Toc62403422)

[electrostatic force *qiqj* < 0 9](#_Toc62403423)

[electrostatic force num 9](#_Toc62403424)

[electric field point charge 10](#_Toc62403425)

[Notes and version 10](#_Toc62403426)

# Examples

*x*

*y*

*z*



*x*

*y*

*z*

200

*Fy*

*t*

0.02

0.04

200

*Fx*

*t*

0.02

0.04

4



*x*med = *xm*

Start

*x*min, *x*max, *x*med

1

*j* ≤ *N*

*j* = *j* + 1

2

*i* = *i* + 1

N

Y

*θ*

*x*

*y*

*z*

*μs*, *uk*

*I*, *R*

*ω*, *α*

*v*, *a*

# Ideal gas law

*p*

*V*

*V*1

*V*2

*V*3

*p*3

*p*1

*p*2

1

2

3

*piVi* = *nRTi*

*i* = 1, 2, 3

*T*3

*T*1

*T*2

*p*

*V*

*V*2

*V*1

*p*2

*p*1

2

1

*T*2

*T*1

*X*1→2

*p*

*V*

*V*1

*V*2

*p*2

*p*1

1

2

*T*1

*T*2 > *T*1

*W*1→2

# Ideal gas processes

*T*2 > *T*1

*V*

*V*1

*V*2

*p*

*p*1

*p*2

1

2

*T*1

*X*1→2

*T*2 > *T*1

*p*

*p*1

*p*2

1

2

*T*1

*X*1→2

*V*

*V*1

*V*2

*p*

*p*1 = *p*2

1

2

*T*1

*T*2 > *T*1

*X*1→2

*V*

*V*1

*V*2

*V*

*V*1 = *V*2

*p*

*p*2

*p*1

1

2

*T*1

*T*2 > *T*1

*X*1→2

*p*

*p*1

*p*2

1

2

*T*1

*T*2 < *T*1

*X*1→2

*V*

*V*1

*V*2

*p*

*p*1

*p*2

1

2

*T*1

*T*2 = *T*1

*X*1→2

*V*

*V*1

*V*2

*p*

*T*1

*V*

*V*2

*T*2 > *T*1

*T*3 > *T*2



*pV* = *c*

*c* = *nRT*

*p*

*T*1

*V*

*V*2

*T*2 > *T*1

*T*3 > *T*2



# Ideal gas work

*p*

*V*

*V*1

*V*2

*p*2

*p*1

1

2

*T*1

*T*2 > *T*1

*W*1→2



*T*1 > *T*2

*p*

*V*

*V*2

*V*1

*p*1

*p*2

2

1

*W*1→2

*T*1



*T*2 > *T*1

*p*

*p*1

*p*2

1

2

*T*1

*W*1→2

*V*

*V*1

*V*2

*p*

*p*1 = *p*2

1

2

*T*1

*T*2 > *T*1

*W*1→2

*V*

*V*1

*V*2



*T*2 > *T*1

*T*2 > *T*1

*p*

*p*2

*p*1

1

2

*T*1

*W*1→2

*V*

*V*1 = *V*2



*p*

*p*1

*p*2

1

2

*T*1

*T*2 = *T*1

*W*1→2

*V*

*V*1

*V*2



*p*

*p*2

*p*1

2

1

*T*1

*W*1→2

*V*

*V*2

*V*1

*p*

*p*1

*p*2

1

2

*T*1

*T*2 < *T*1

*X*1→2

*V*

*V*1

*V*2

# Isothermal process

*p*

*p*1

*p*2

1

2

*T*1

*T*2 = *T*1

*X*1→2

*V*

*V*1

*V*2

*p*

*p*2

*p*1

2

1

*T*2 = *T*1

*T*1

*X*1→2

*V*

*V*2

*V*1

# Carnot cycle

*p*

*p*1

*V*

*V*1

1

2

4

3

*p*2

*p*3

*p*4

*V*4

*V*2

*V*3

*p*

*p*1

*V*

*V*1

1

2

4

3

*p*2

*p*3

*p*4

*V*4

*V*2

*V*3

*p*

*p*1

*V*

*V*1

1

2

4

3

*p*2

*p*3

*p*4

*V*4

*V*2

*V*3

*p*

*p*1

*V*

*V*1

1

2

4

3

*p*2

*p*3

*p*4

*V*4

*V*2

*V*3

*p*

*p*1

*V*

*V*1

1

2

4

3

*p*2

*p*3

*p*4

*V*4

*V*2

*V*3

*p*

*p*1

*V*

*V*1

1

2

4

3

*p*2

*p*3

*p*4

*V*4

*V*2

*V*3

  



# Immersed object in center

*x*

*y*

*z*

*x*

*z*

*y*

*y*

*ysf*

*yfs*,0



# Distance and displacement

*y*

*x*

*x*1

*y*1

*x*2

*y*2

*t* *=* *t*A

*t* = *t*B

*t* = *t*C

*A*

*B*

*C*

*y*

*x*

*l*

*l*

4*l*

2*l*

*A*

*B*

*C*

2*l*

*t* *=* *t*A

*t* = *t*B

*t* = *t*C

1

2

3

4

5

6

7

8

*di*,*i*+1 = *l*

*y*

*x*

Δ*ti*,*i*+1 = *tt*+1 – *ti*

*i* = 1 .. 7

*y*

*x*

2.0

3.5

2.0

1.5

2.5

2.5

*A*

*B*

*C*

*D*

*E*

# Ray source and direction

*x*

*y*

*z*



*θ* = 0.5π

*ϕ*

# Angle of reflection

*θ*inc

*θ*ref



*θ*inc

*θ*ref

# Single ray many spheres



# quadratic formula

Start

*a*, *b*, *c*,  
*x*

*D* ← *b*2 – 4*ac*

1

1



2

2

Start

*x*1, *x*2

# coulomb force def

*x*

*y*

*z*

*o*

*qi*

*qj*



# electrostatic force *qiqj* > 0

*x*

*y*

*z*



*qi*

*qj*



*qi*

*qj*



*qi qj* > 0

*qi*< 0

*qj*< 0

*qi*> 0

*qj*> 0



# electrostatic force *qiqj* < 0

*x*

*y*

*z*



*qi*

*qj*



*qi*

*qj*



*qi qj* < 0

*qi*< 0

*qj*> 0

*qi*> 0

*qj*< 0



# electrostatic force num

*y*

*x* (μm)

1

*q*1

2

3

4

5

0

0

1

2

3

4

5

–

+

*q*2

*y*

*x*

2

*q*4

4

6

8

10

0

0

2

4

6

8

10

+

+

*q*3

*y*

*x*

0.5

*q*6

1

1.5

2

2.5

0

0

1

2

3

4

5

*q*5

–

–

*sy* (μm)

*x*

*y*

*z*

*sz* (μm)

*sx* (μm)

*sy* (μm)

*x*

*y*

*z*

*sz* (μm)

*sx* (μm)

*sy* (μm)

*x*

*y*

*z*

*sz* (μm)

*sx* (μm)

*q*1

*q*1

*q*2

*q*2

*q*3

*q*4

# electric field point charge

*qi*

*qj*

*Fij*

*qi*

*qj*

*Fij*

*qj*

*Ej*

*qj*

*Ej*

*x*

*y*

*z*

# Notes and version

* 130% (Jekyll + MathJax), save as 0000x first then save as back to 0000, remove 0000x then, x = i
* 20201215, 17, 24, .., 20210102, 05, 20210123