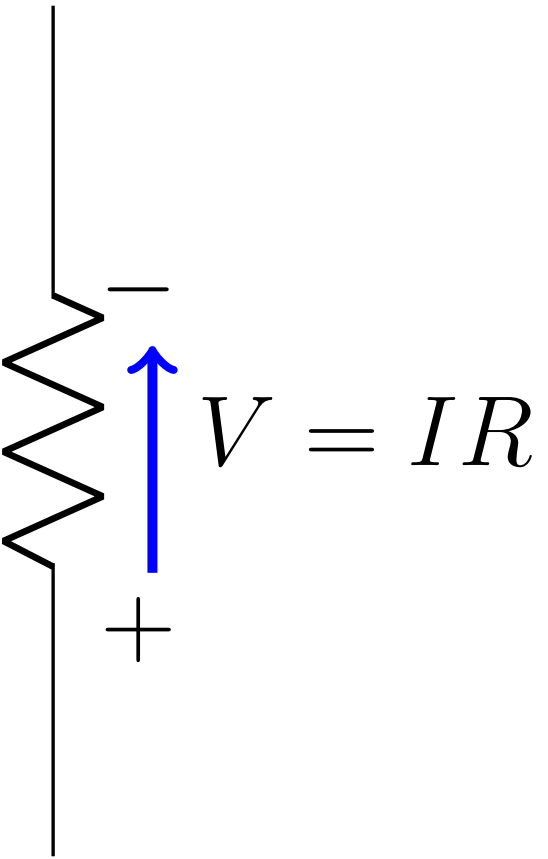
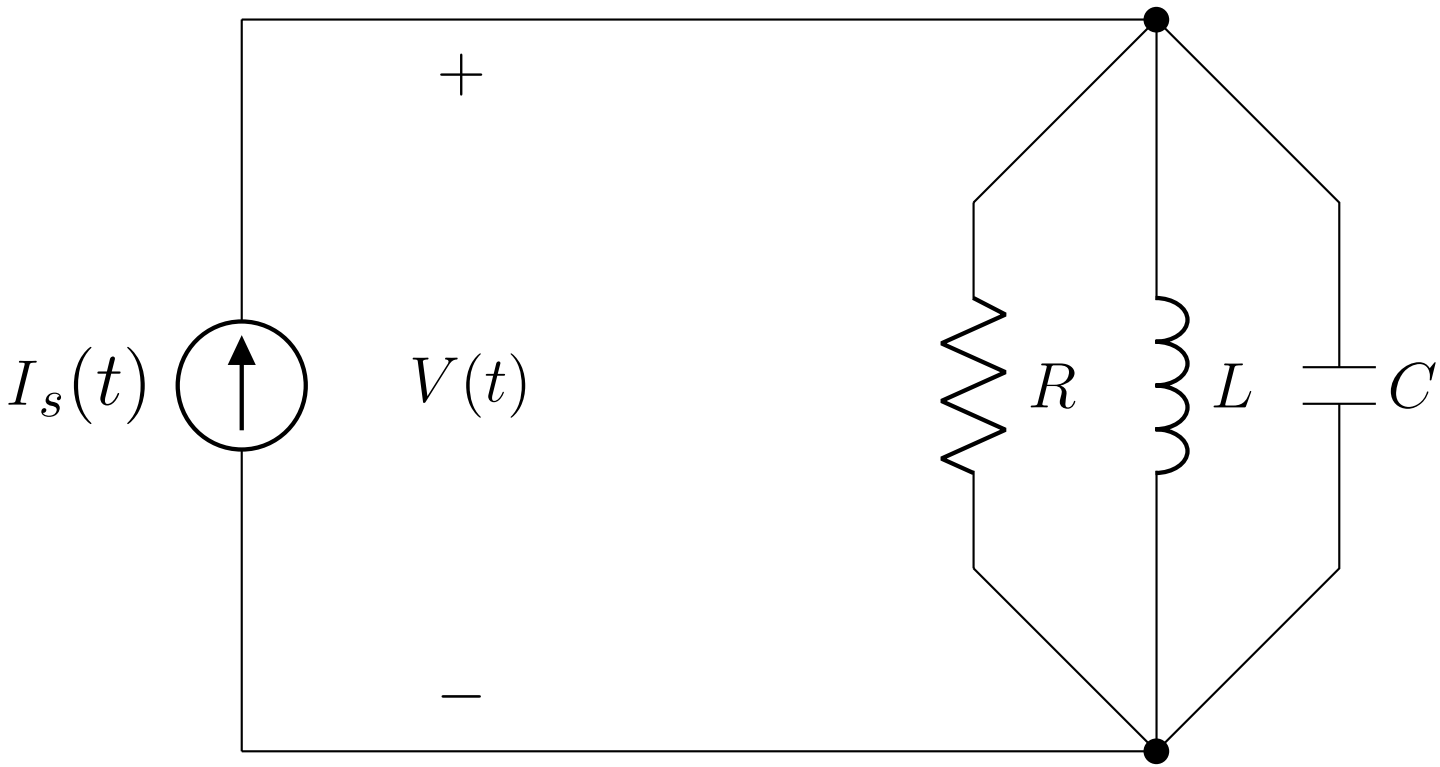
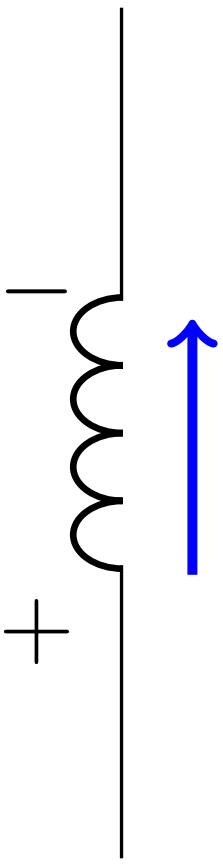
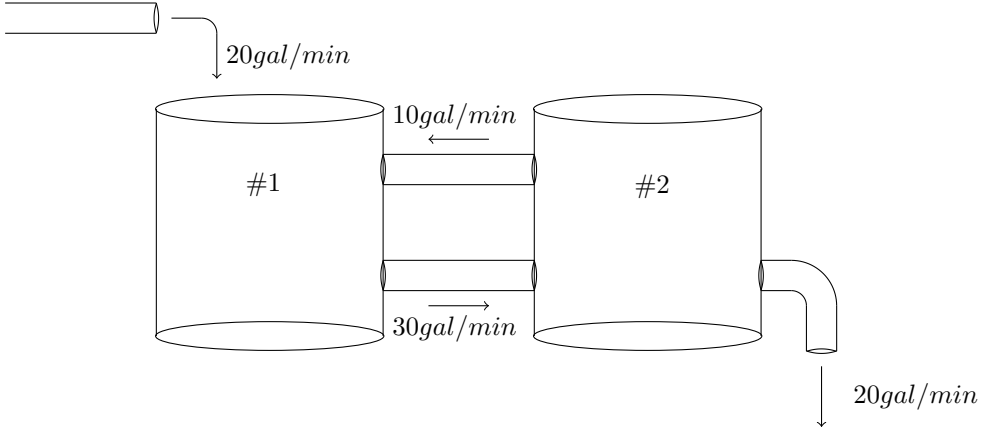
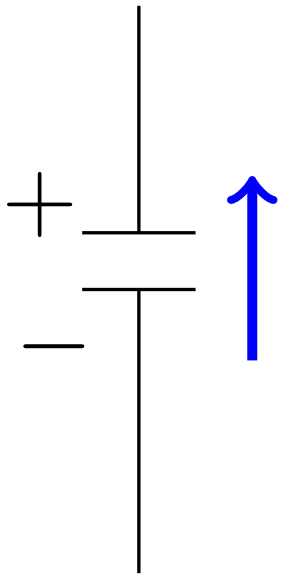

−
+
$V = IR$


+
$I_s(t)$
$V(t)$
R
L
C
−



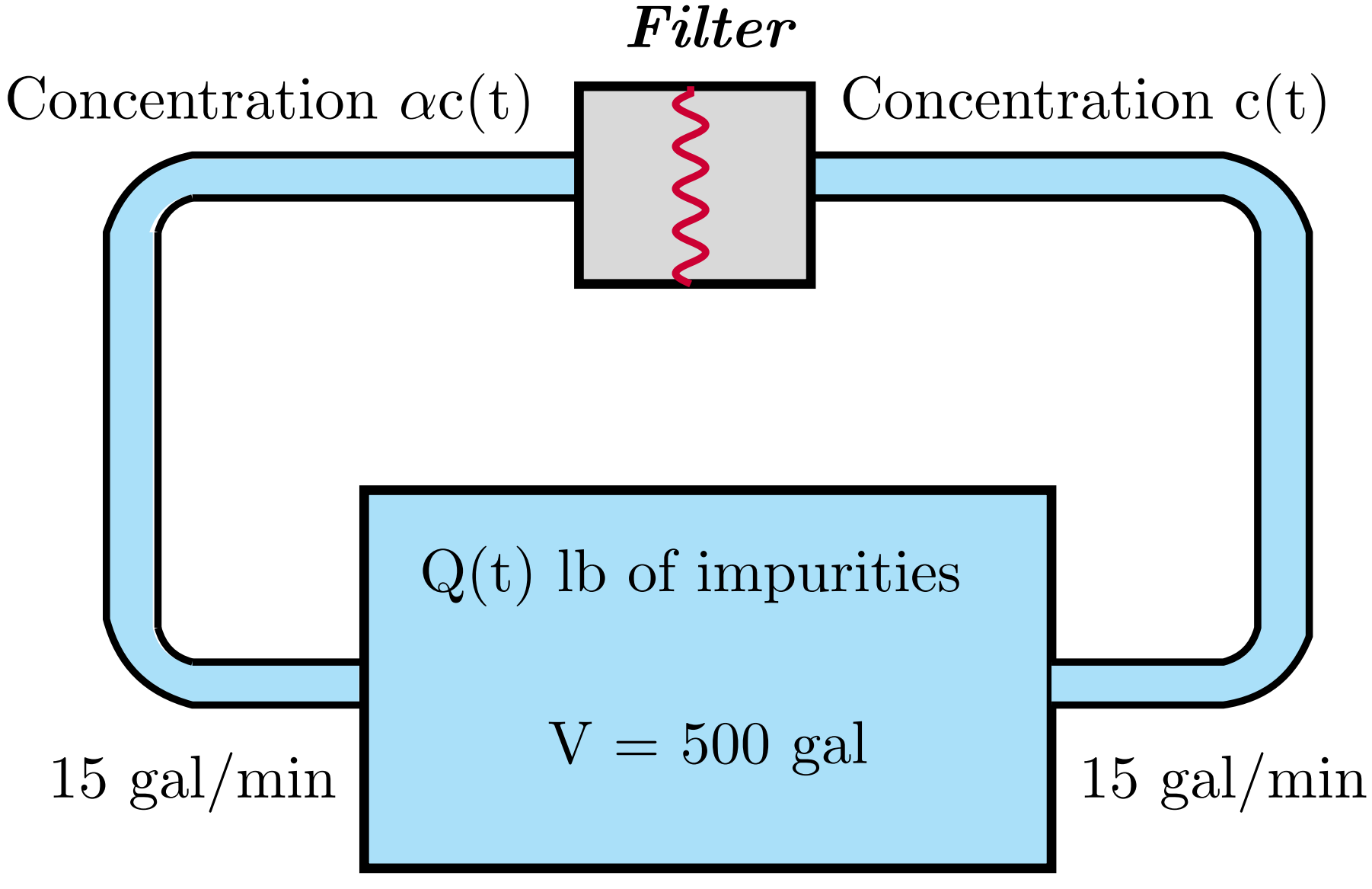
$$V = L \, \frac{di}{dt}$$


$20gal/min$
$10gal/min$
#1
#2
$30gal/min$
$20gal/min$

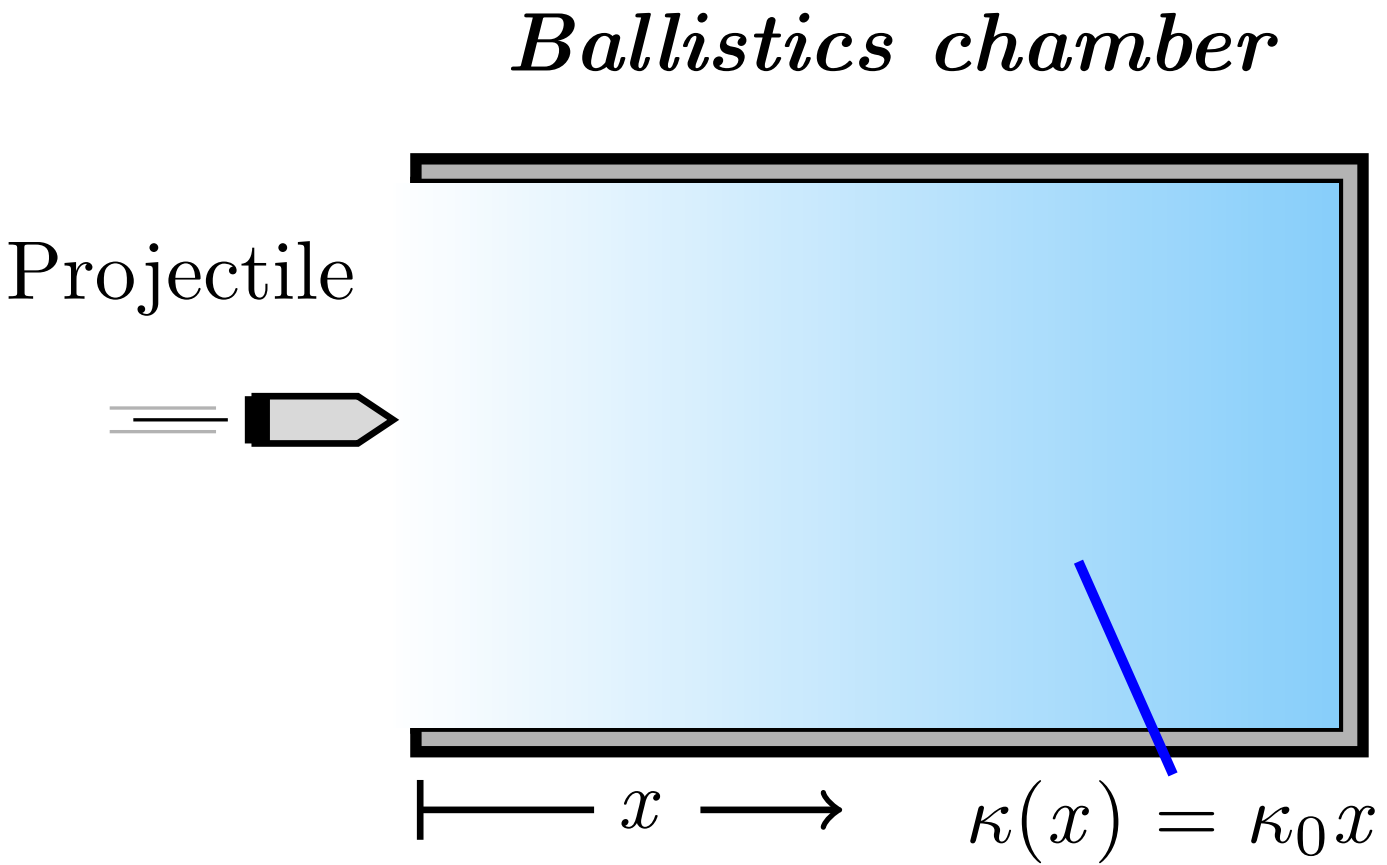


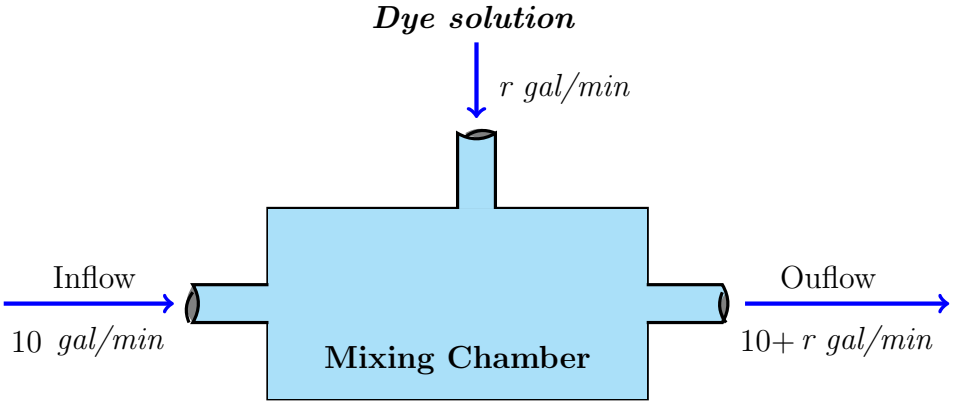
$$V = \frac{1}{C} Q$$

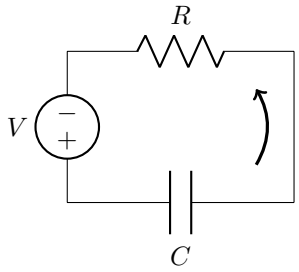
$$I = C \frac{dV}{dt} = \frac{dQ}{dt}$$

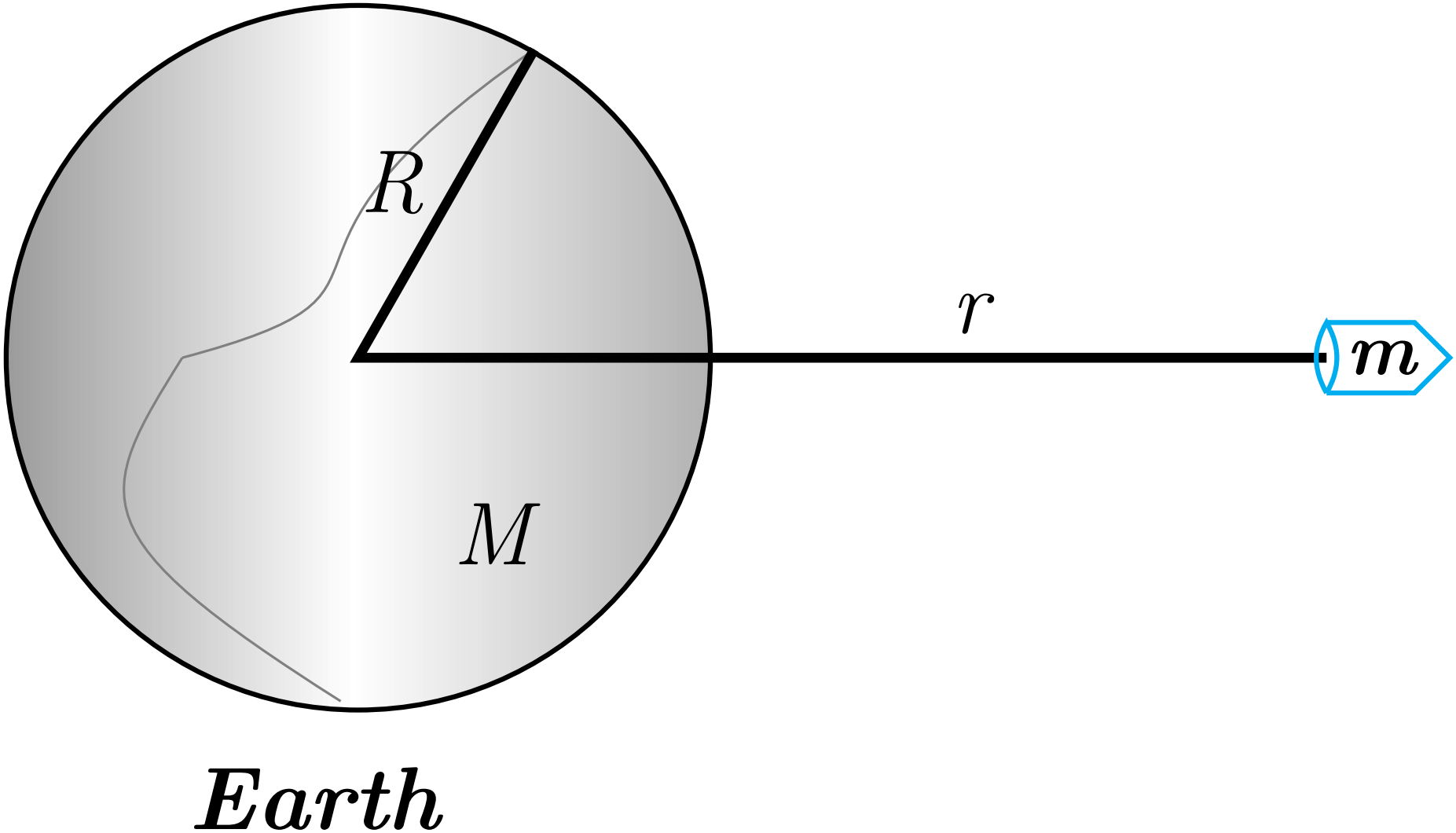

Filter
Concentration αc(t)
Concentration c(t)
Q(t) lb of impurities
V = 500 gal
15 gal/min
15 gal/min

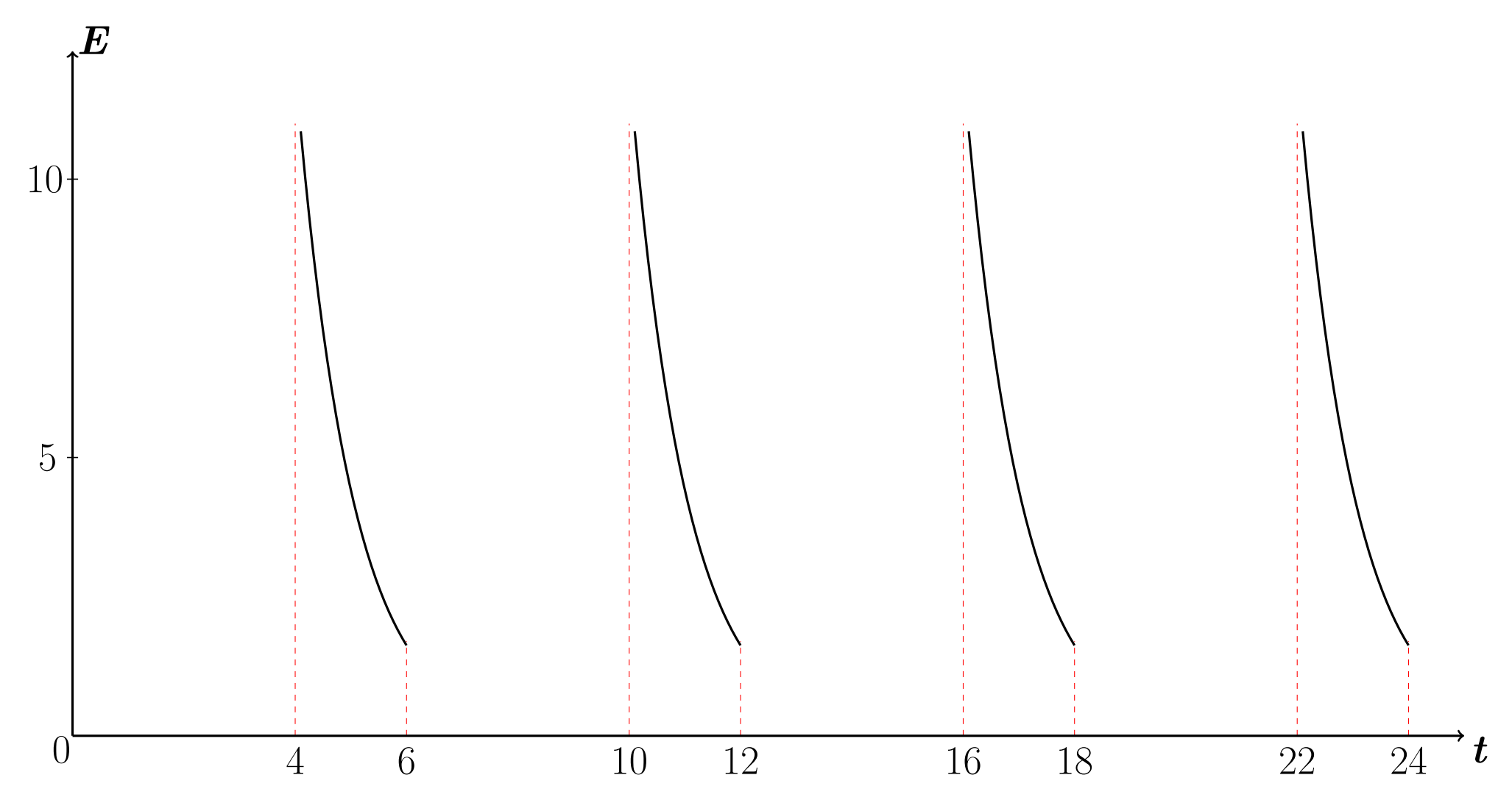
Aquarium


Ballistics chamber
Projectile
x
$\kappa(x) = \kappa_0 x$

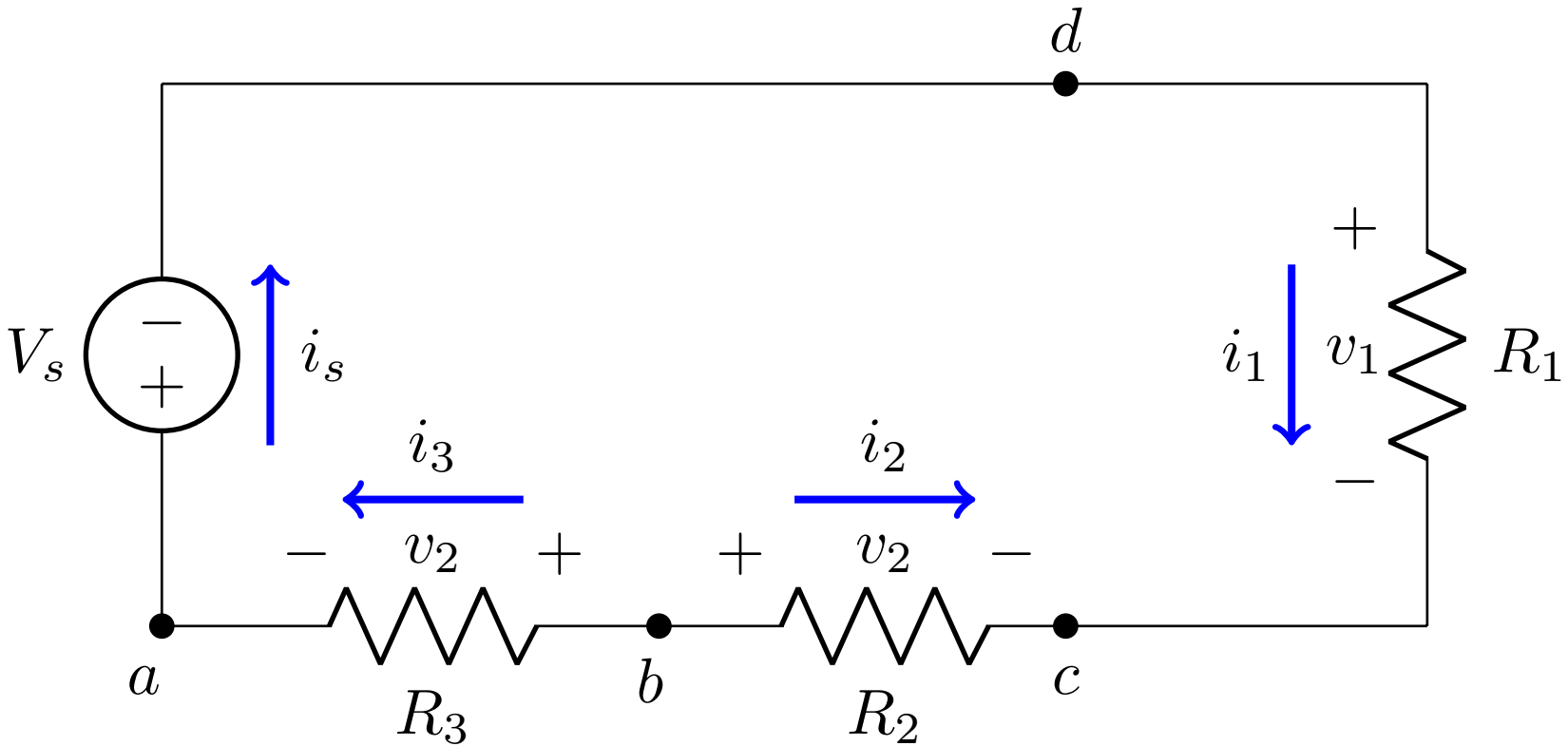

Dye solution
r gal/min
Inflow
10 gal/min
Mixing Chamber
Ouflow
10+ r gal/min

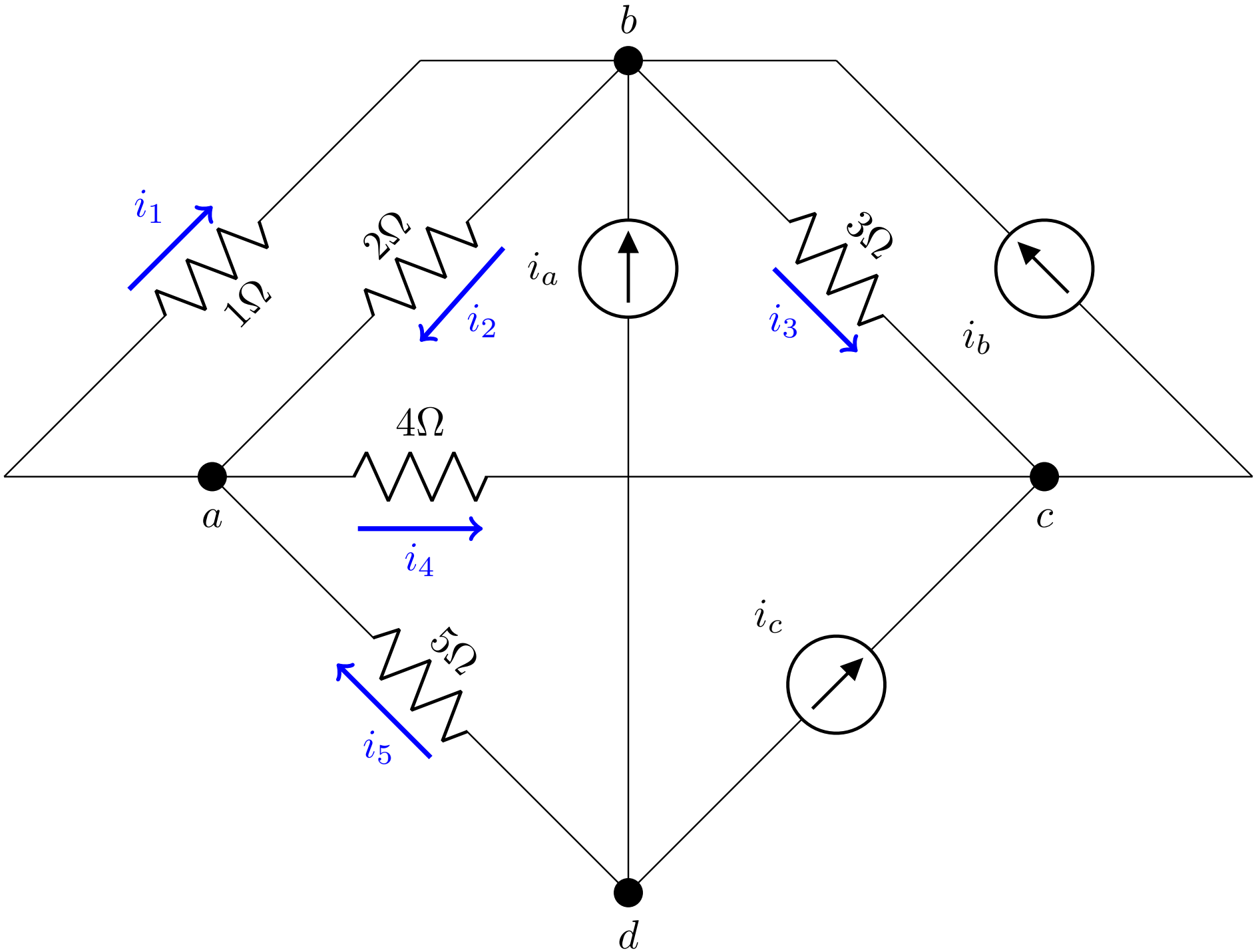

R
V
−
+
C

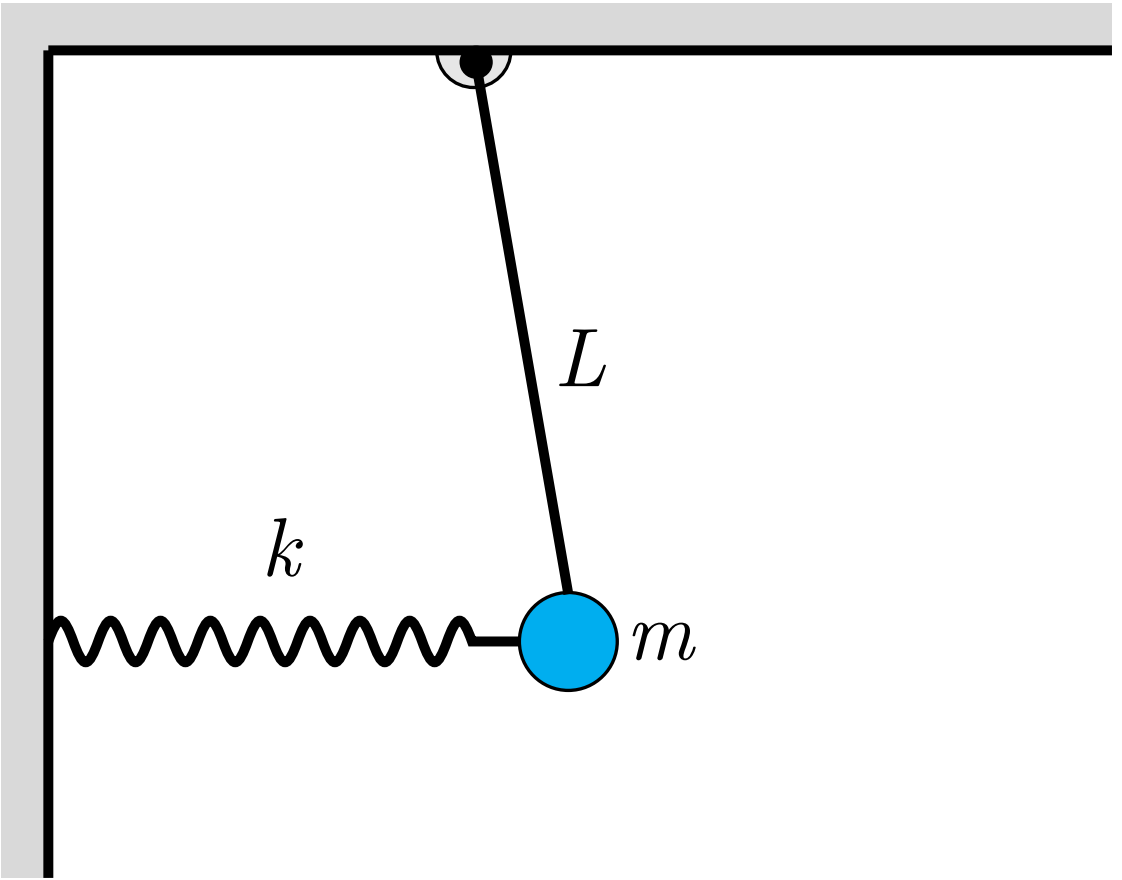

R
r
m
M
Earth

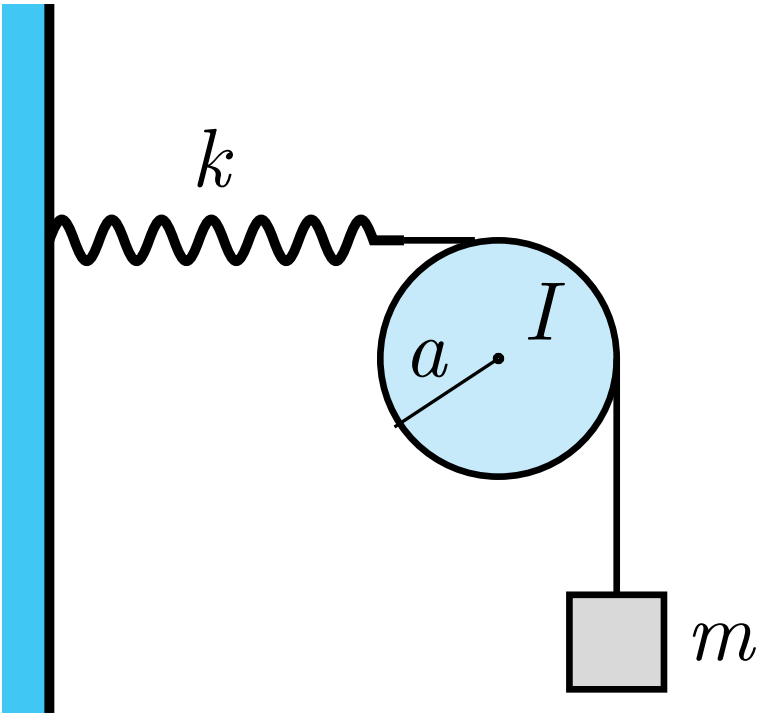

E
10
5
0
4
6
10
12
16
18
22
24
t

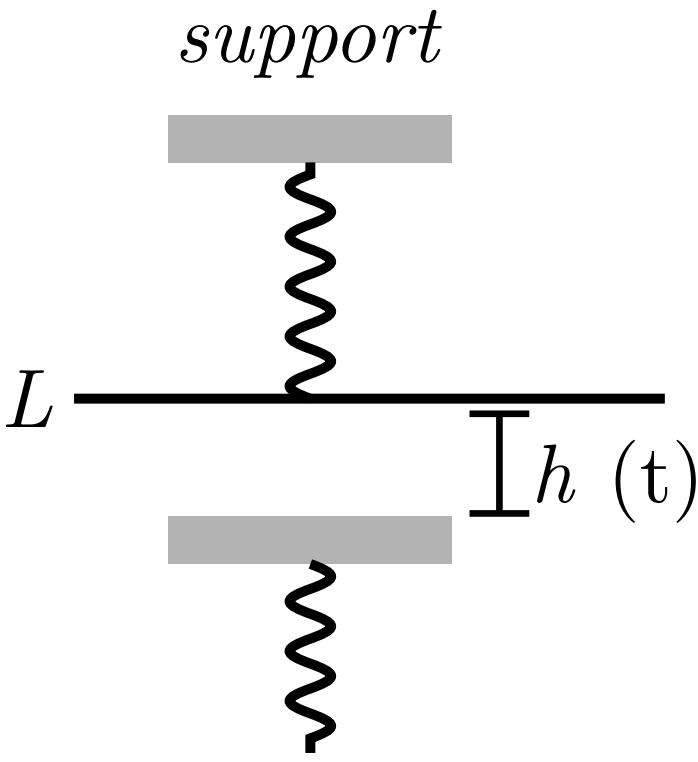
A(t)
2000
0
t

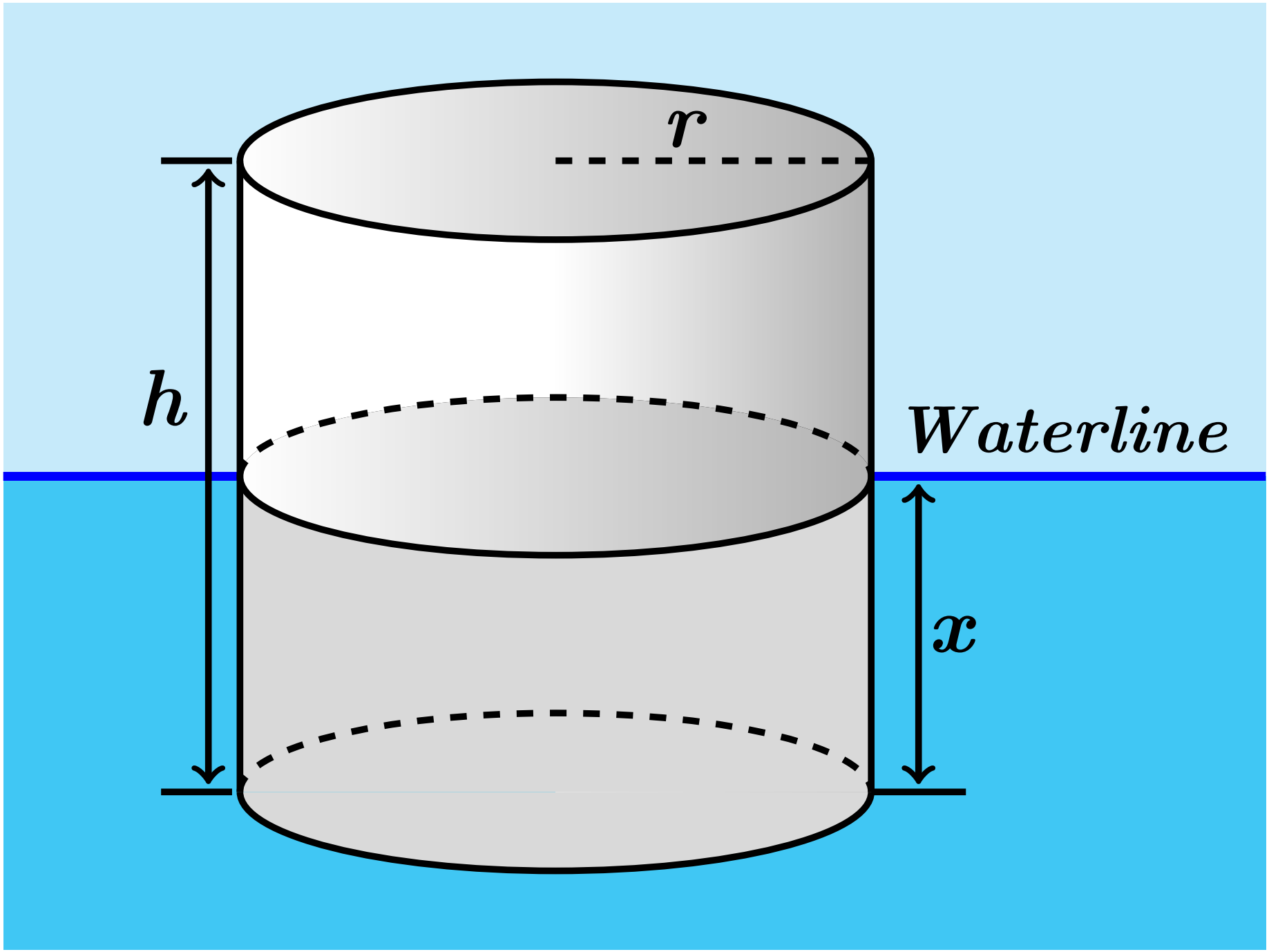

d
V_s
i_s
i_1
v_1
R_1
i_3
i_2
v_2
v_2
a
b
c
R_3
R_2

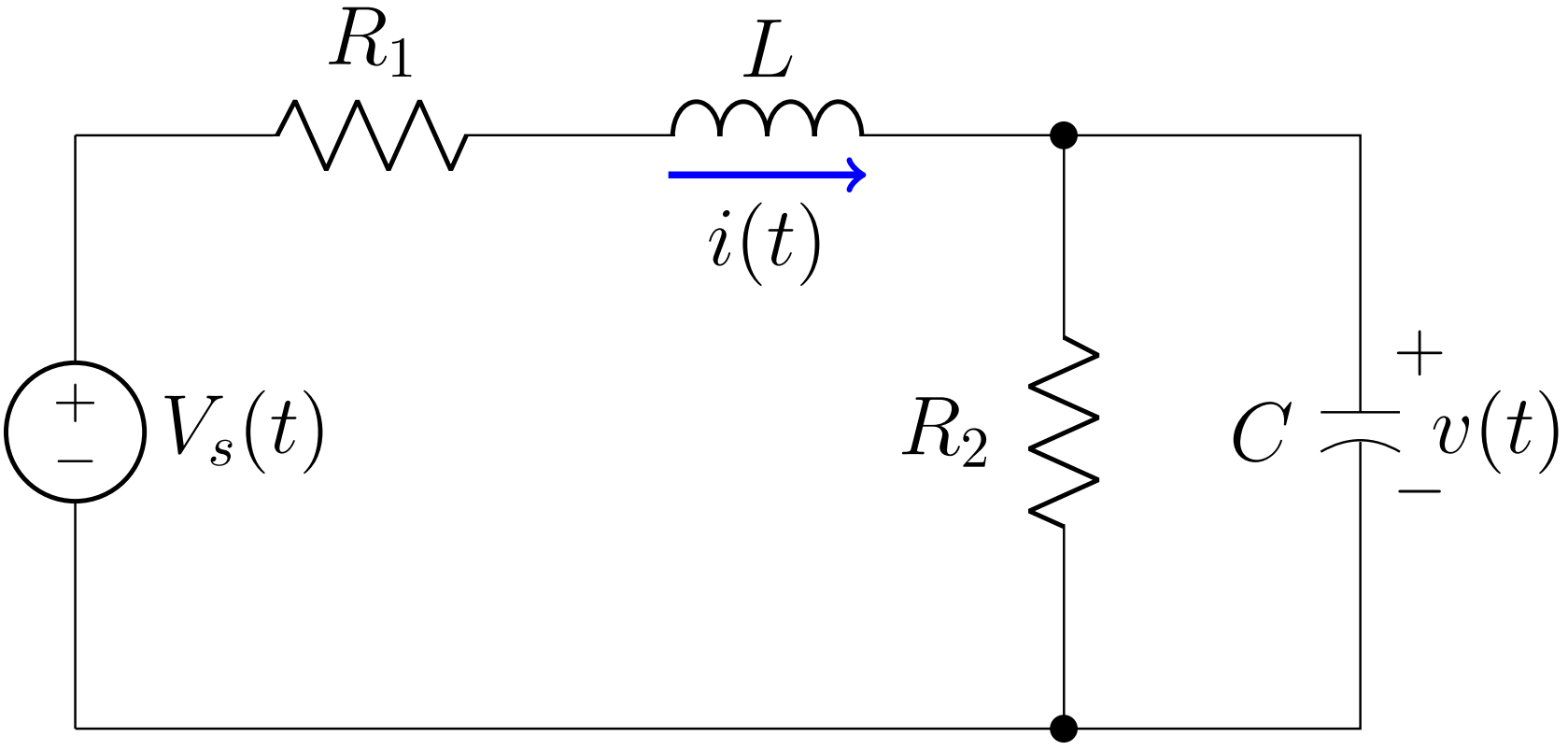

b
i_1
1Ω
2Ω
i_2
i_a
3Ω
i_3
i_b
4Ω
a
i_4
c
i_c
5Ω
i_5
d

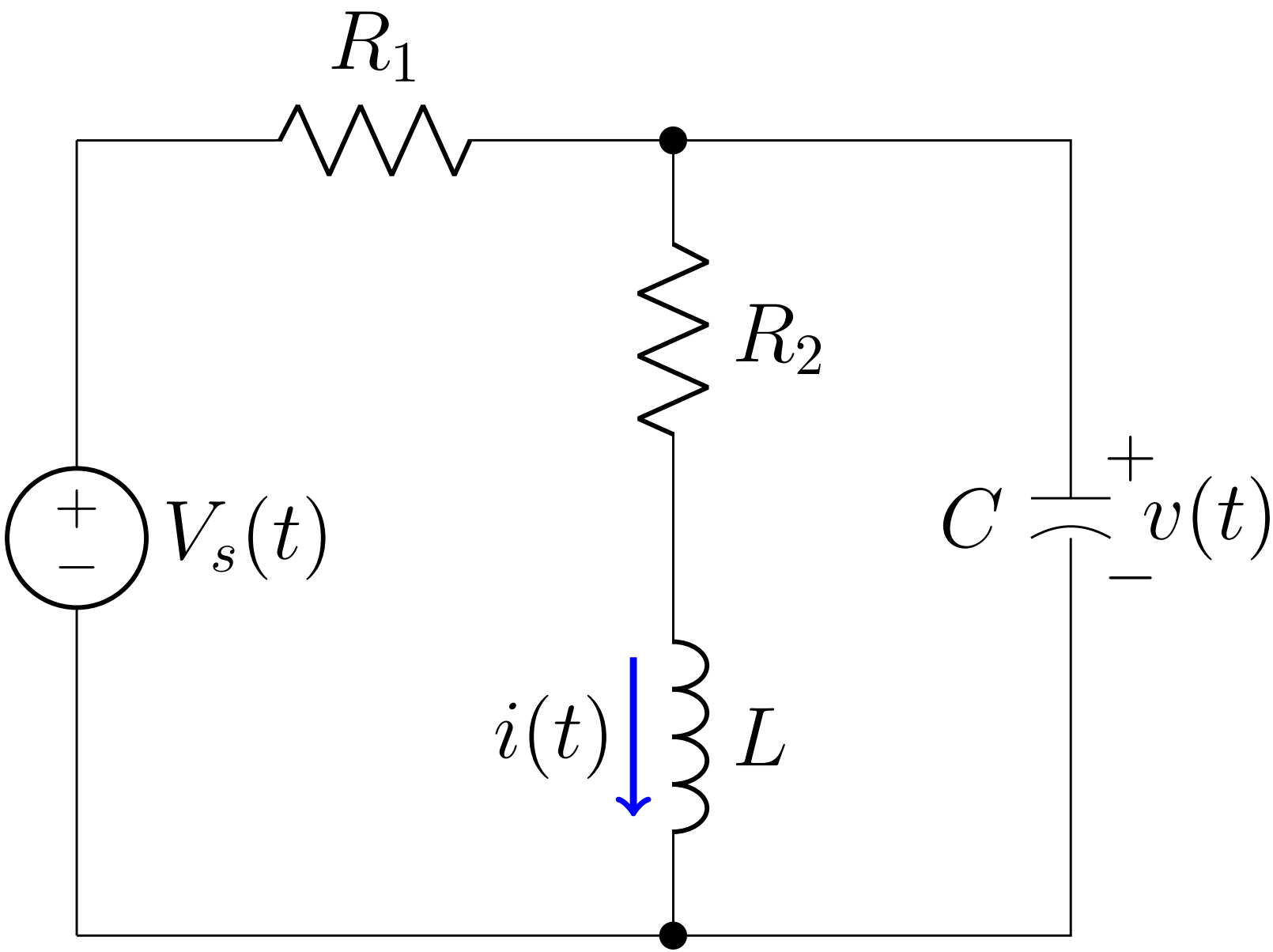

L
k
m

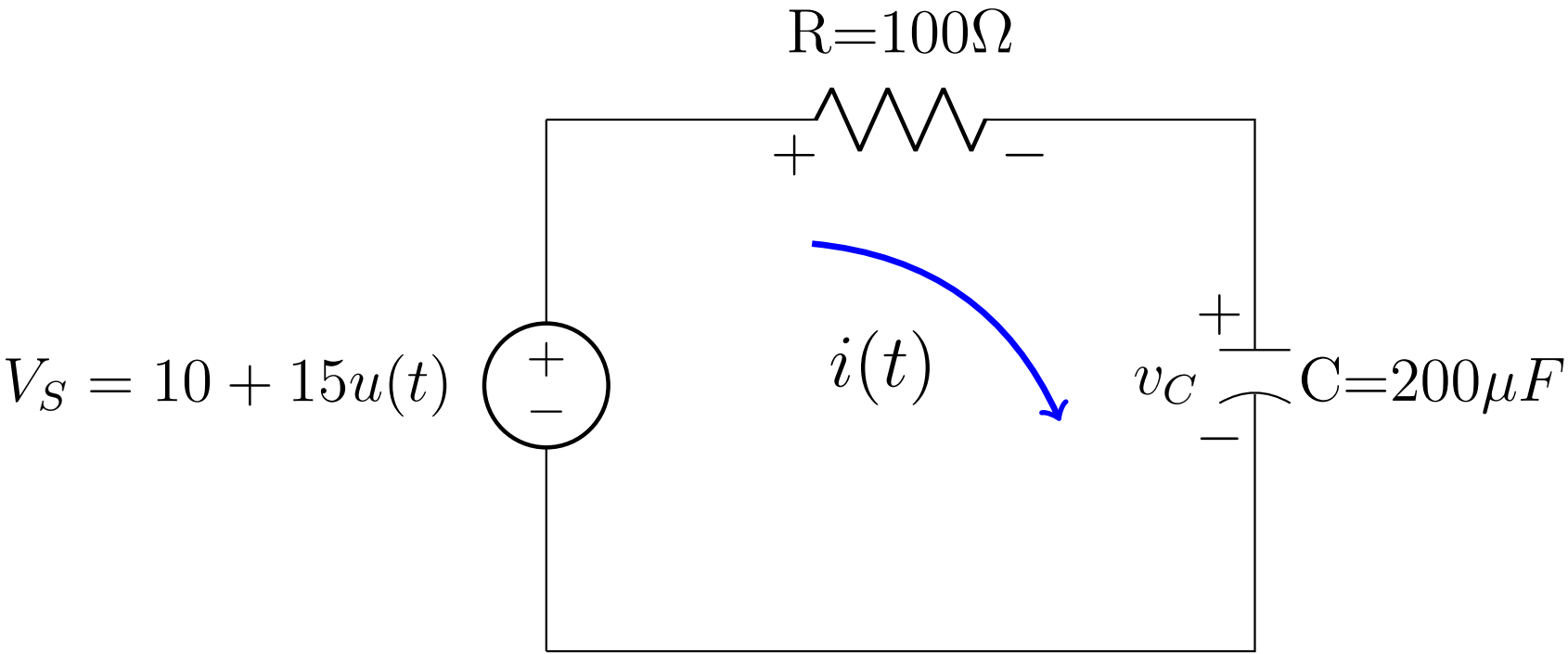

k
I
a
m

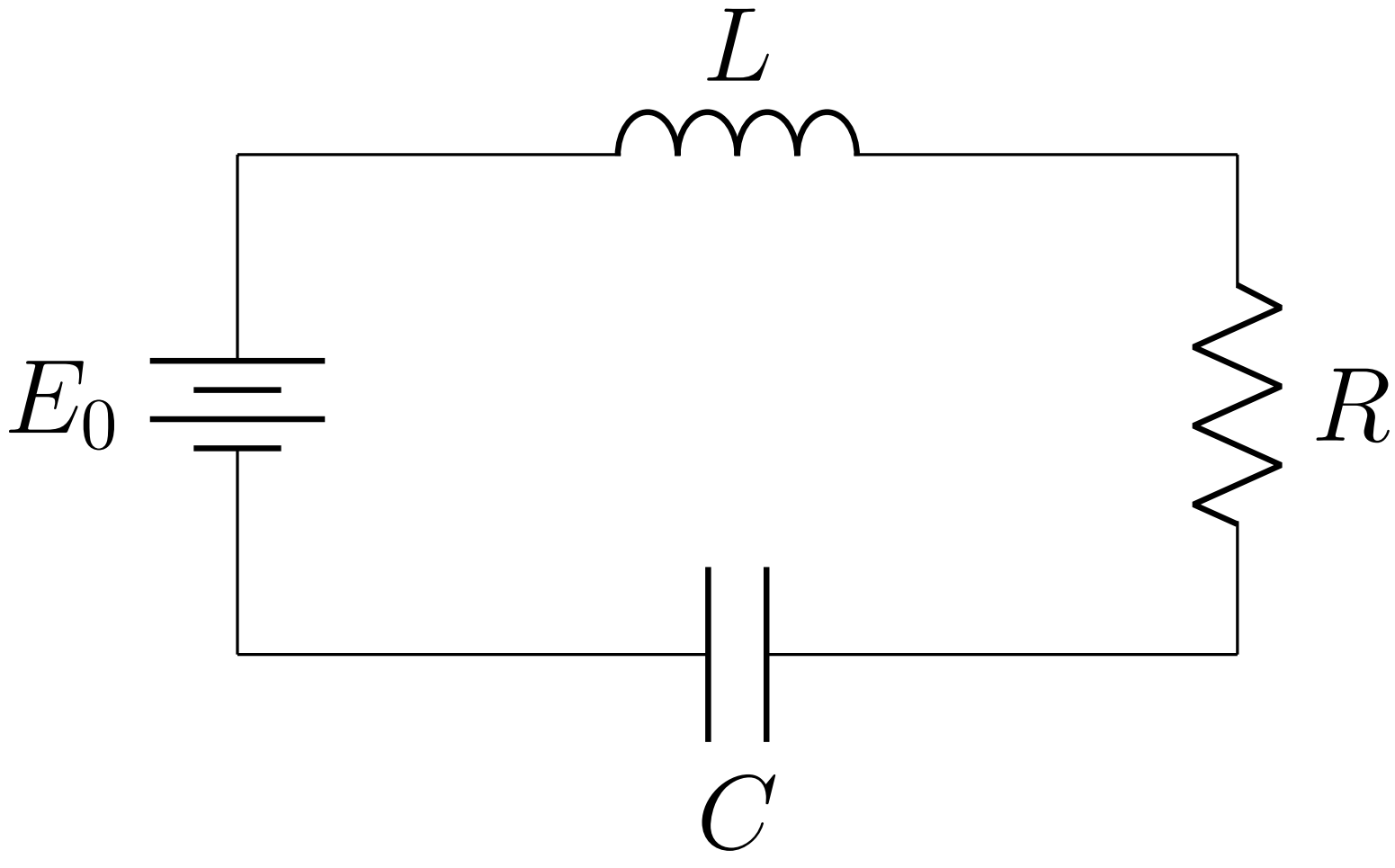

support
L
h (t)

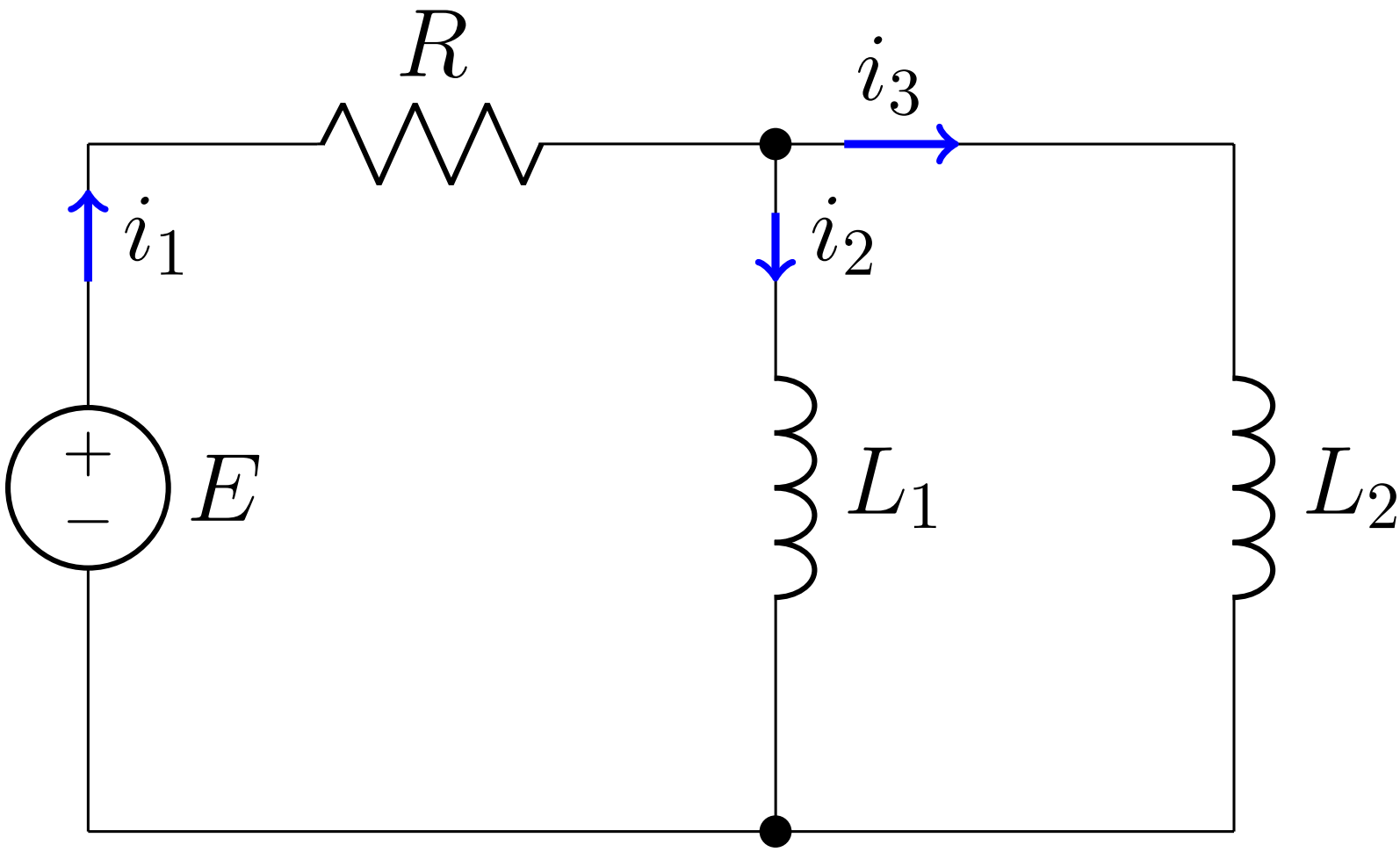

r
h
Waterline
x

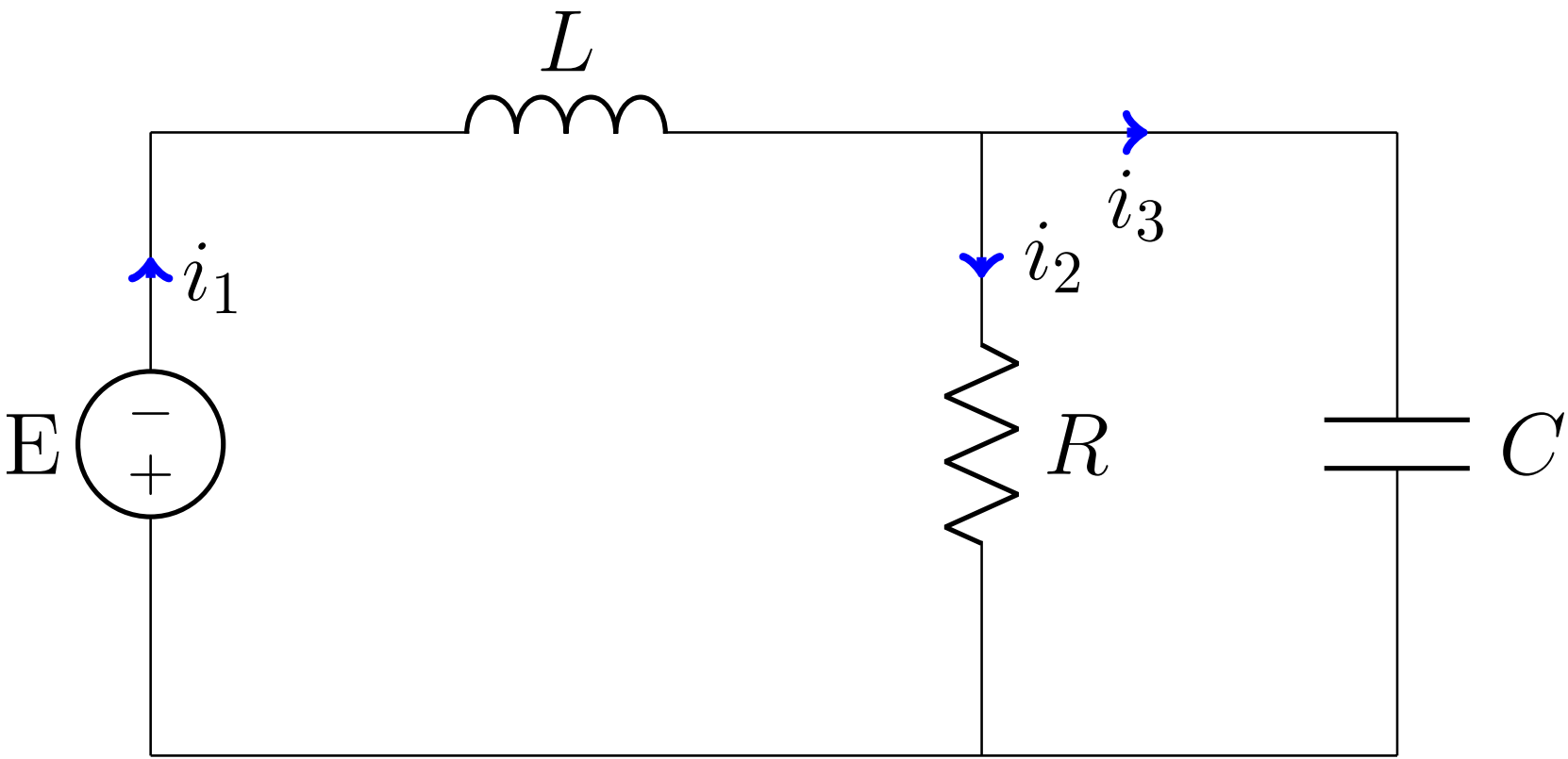

R_1
L
$i(t)$
$V_s(t)$
R_2
C
$v(t)$

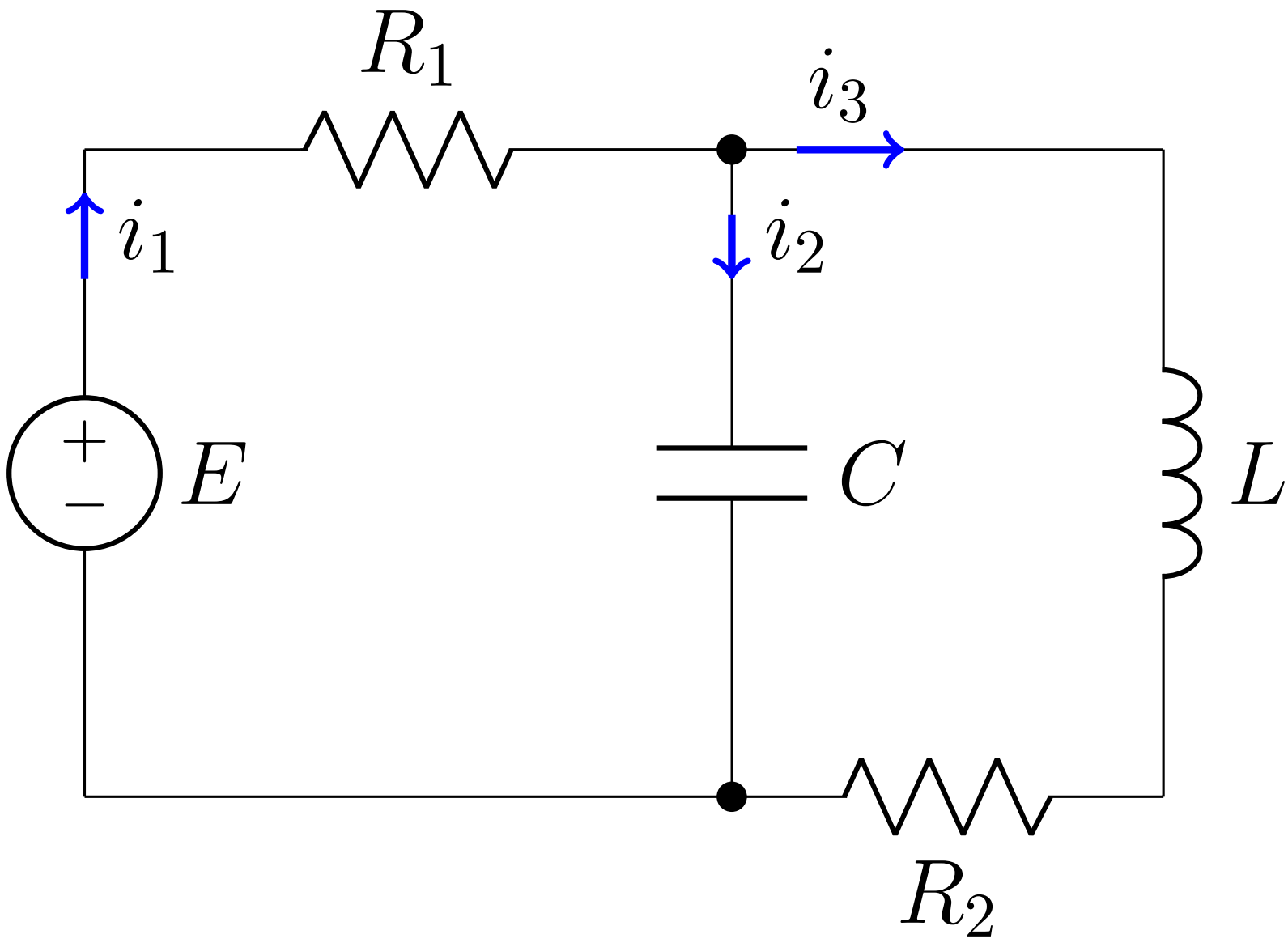

R_1
R_2
$V_s(t)$
C
$v(t)$
$i(t)$
L

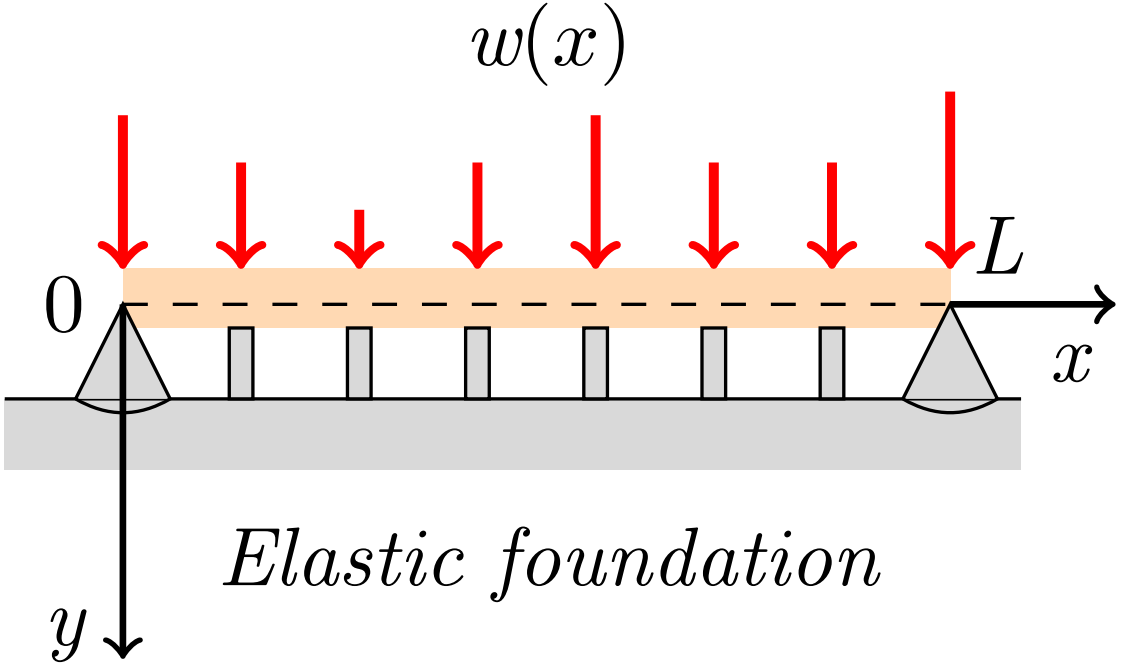

R=100Ω
+
−
$V_S = 10 + 15u(t)$
+
−
$i(t)$
+
v_C
−
C=200μF

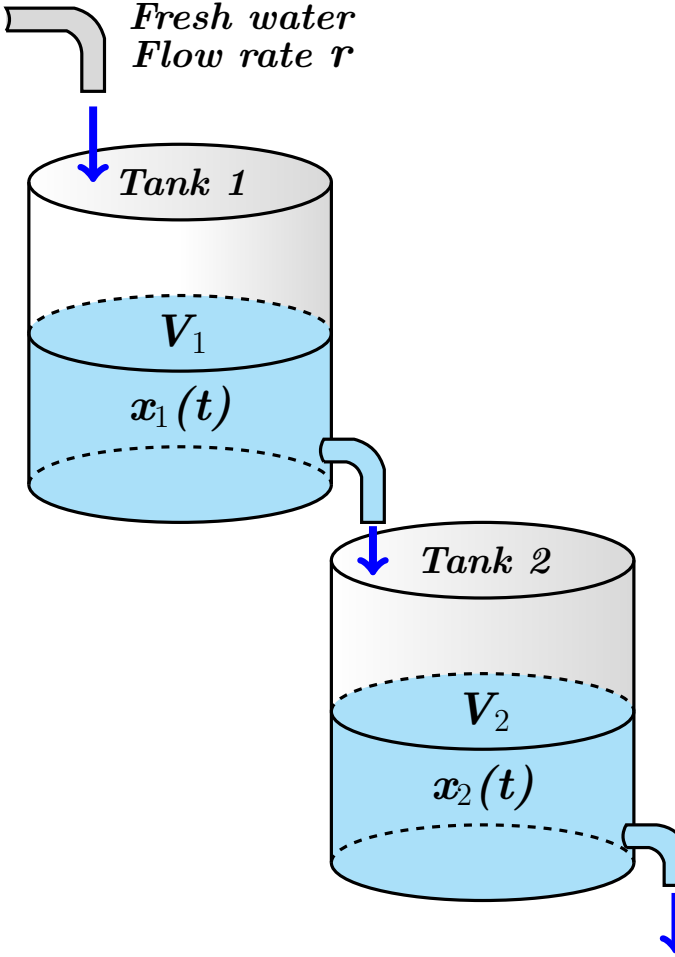

L
E_0
R
C

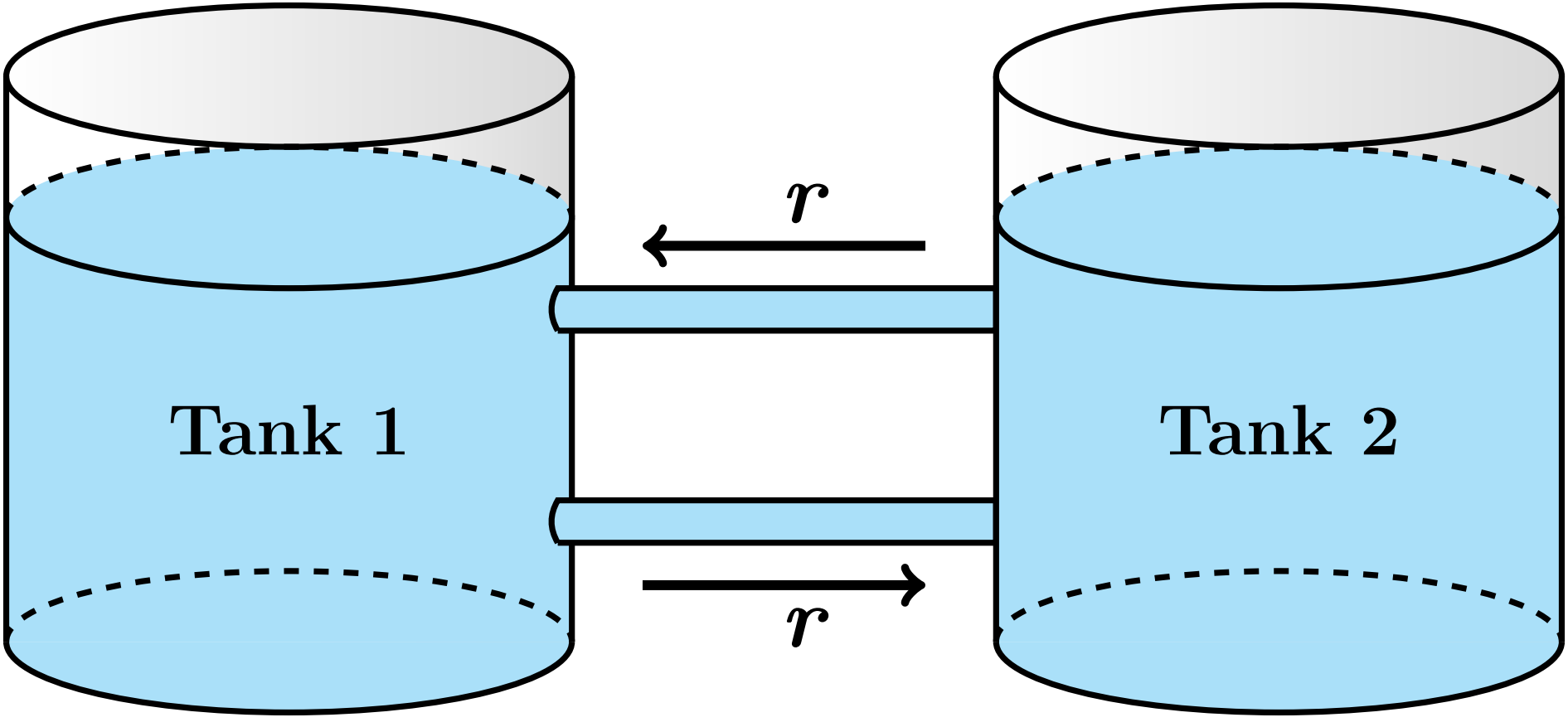

R
i3
i1
i2
E
L1
L2

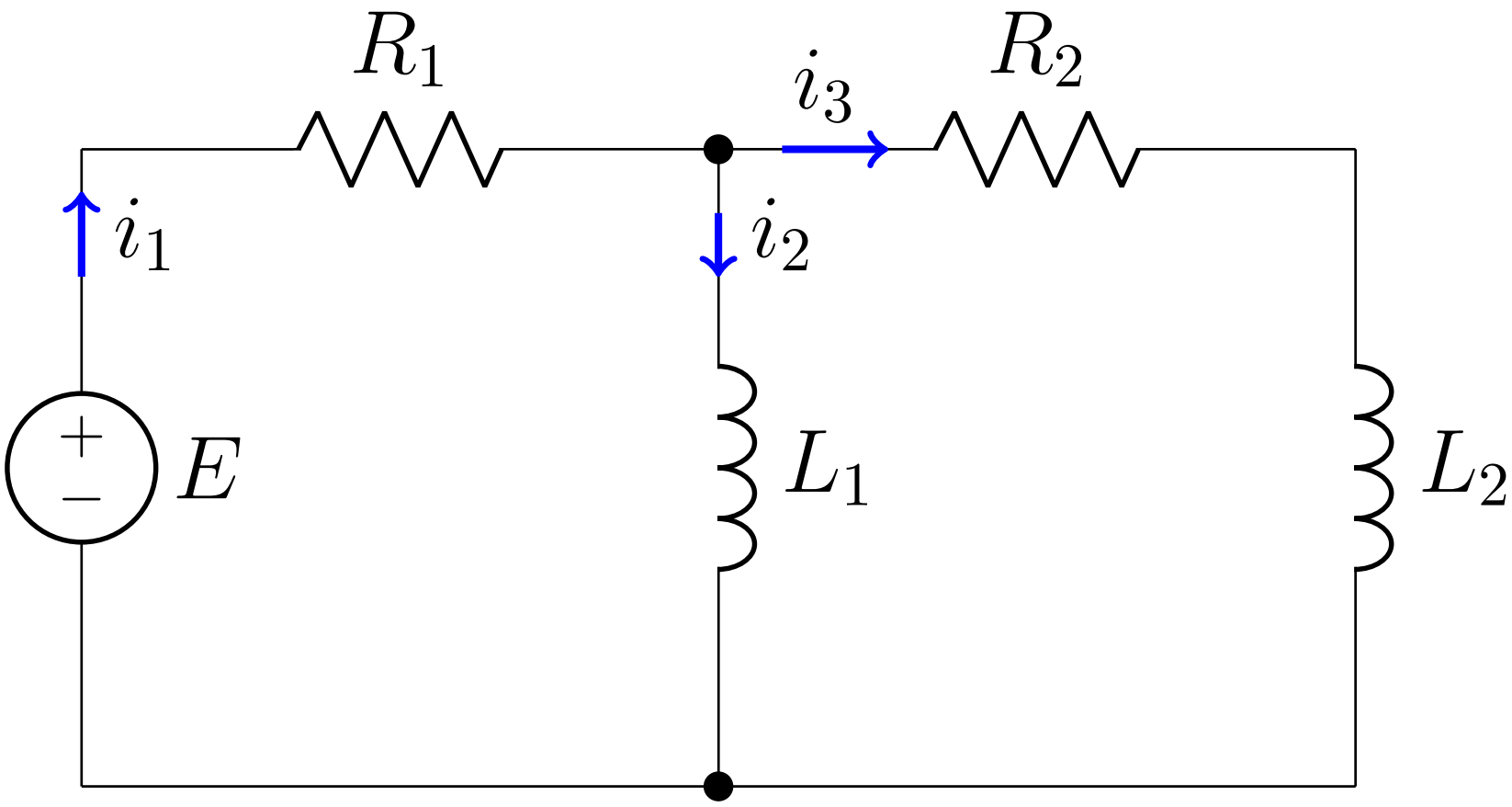

L
i1
i2
i3
E
R
C

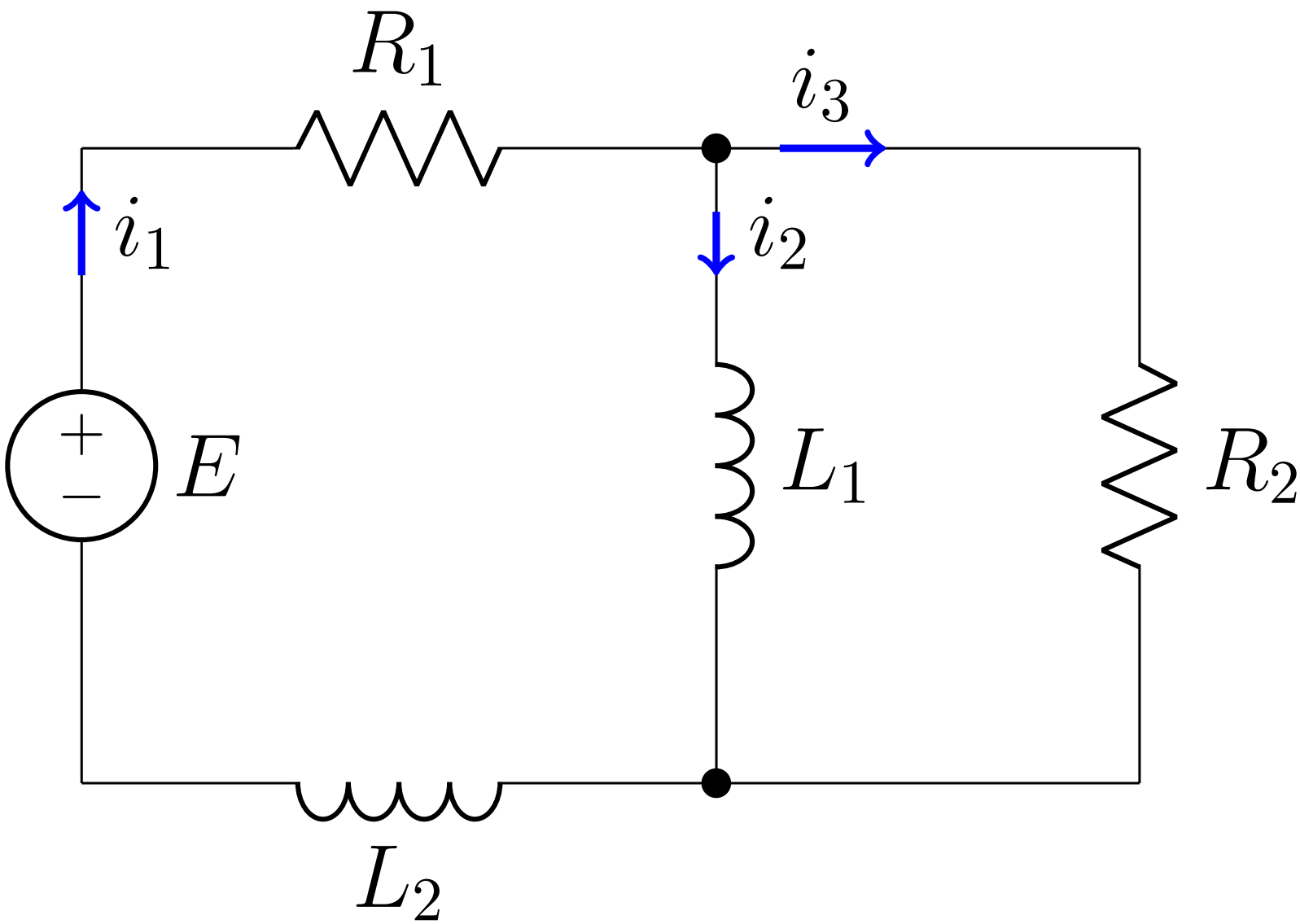

R_1
i_3
i_1
i_2
E
C
L
R_2

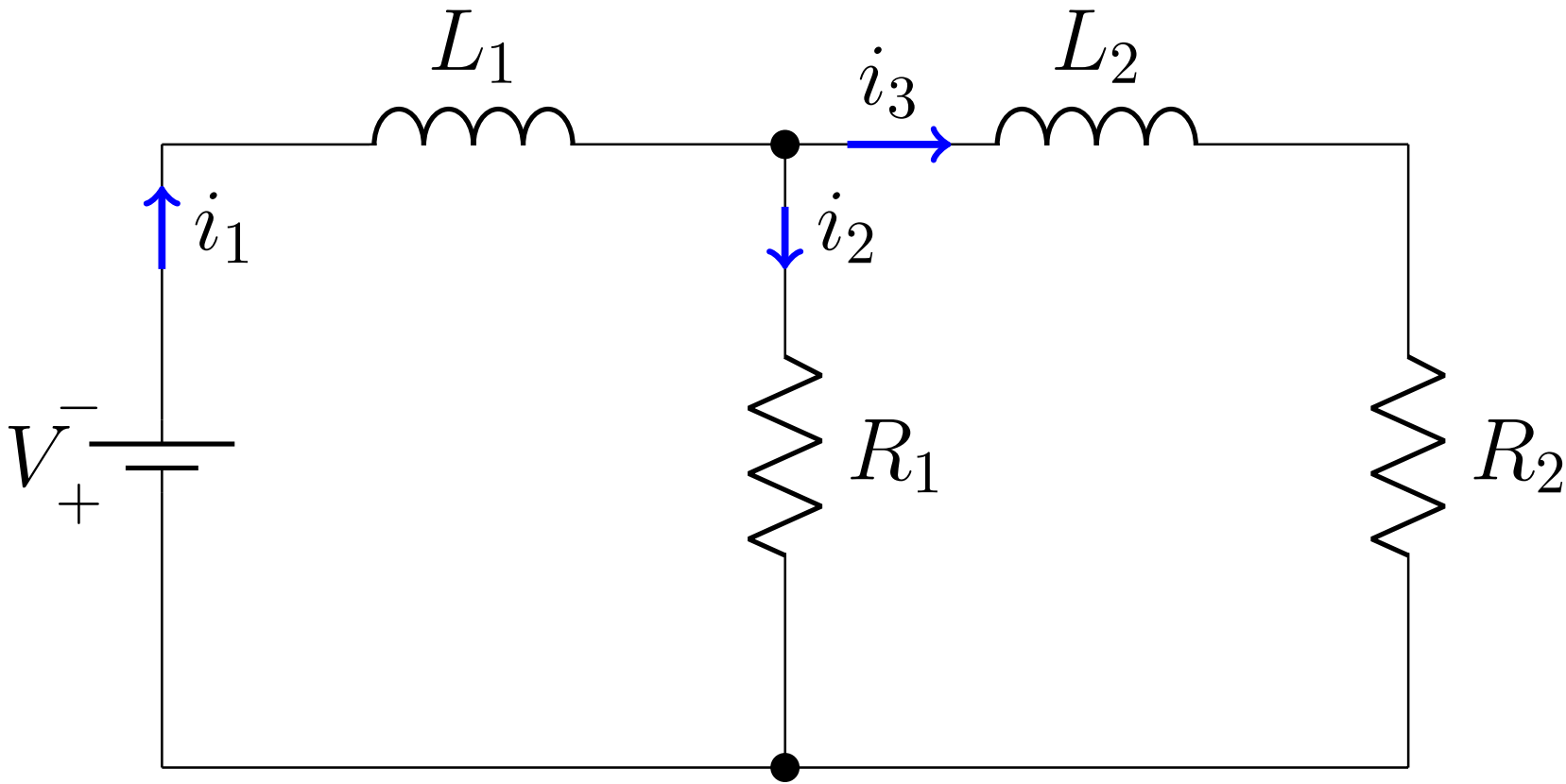

w(x)
L
0
x
y
Elastic foundation

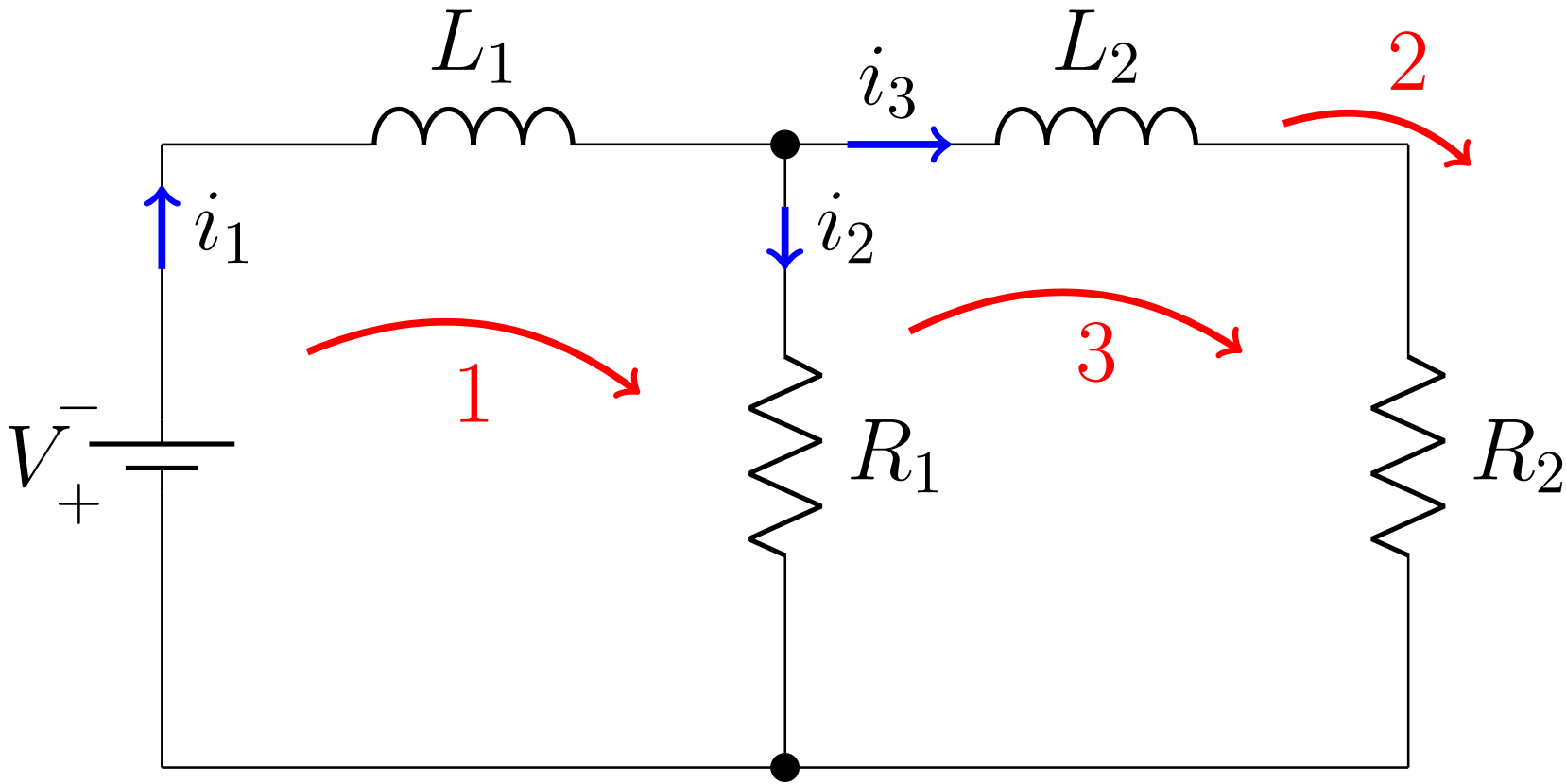

Fresh water
Flow rate r
Tank 1
V1
x1 (t)
Tank 2
V2
x2 (t)

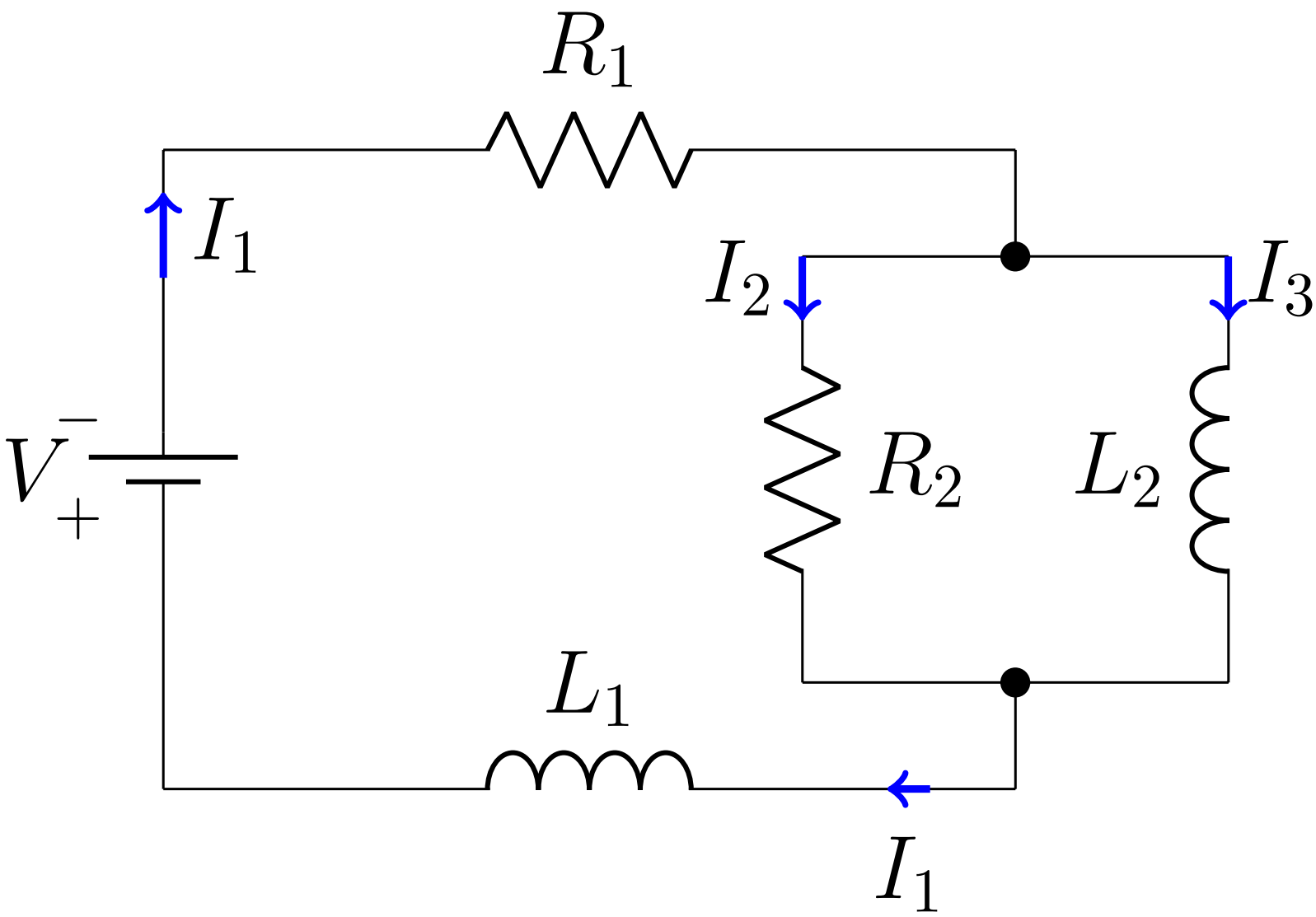

r
Tank 1
Tank 2
r

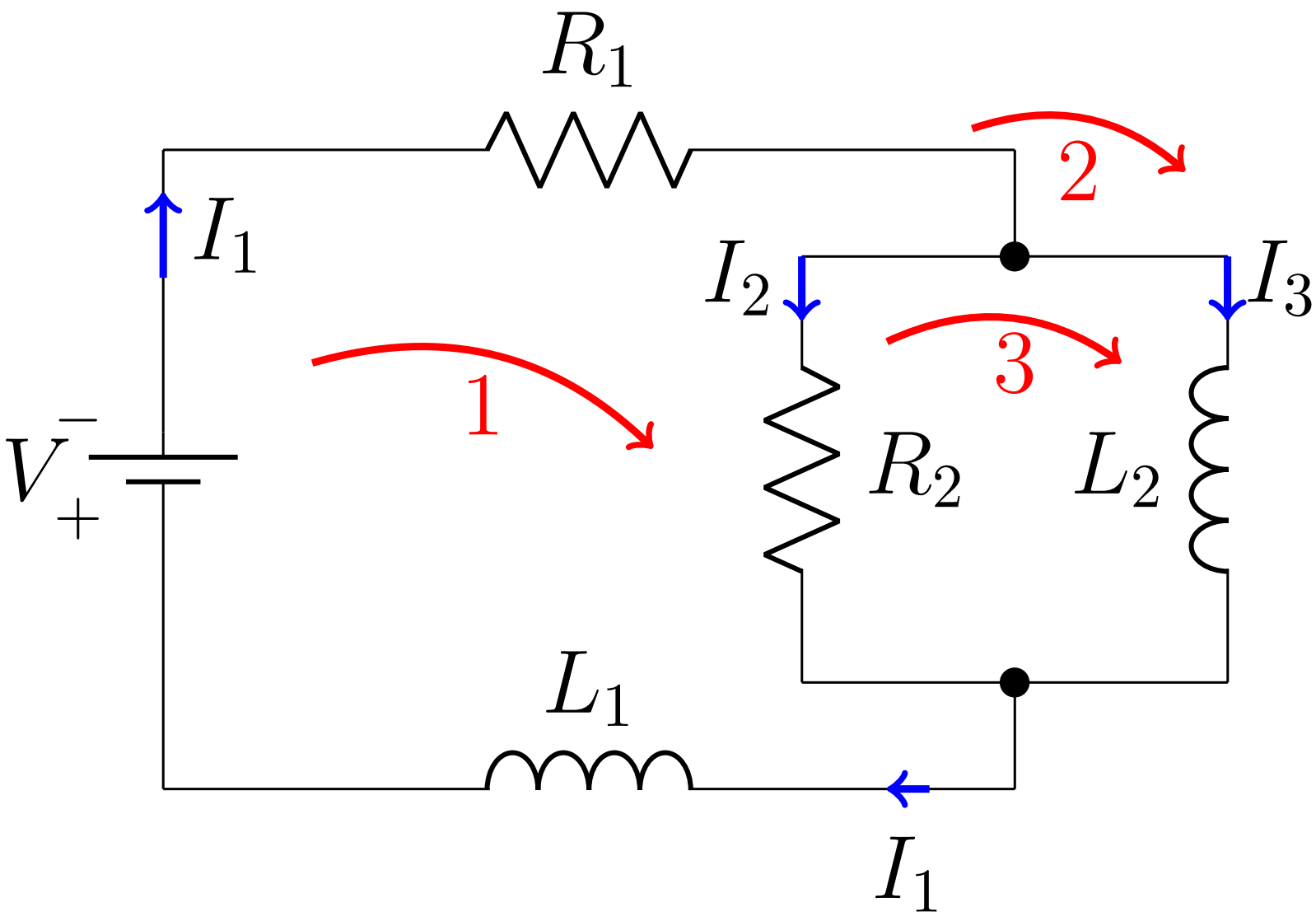

R_1
i_3
R_2
i_1
i_2
E
L_1
L_2

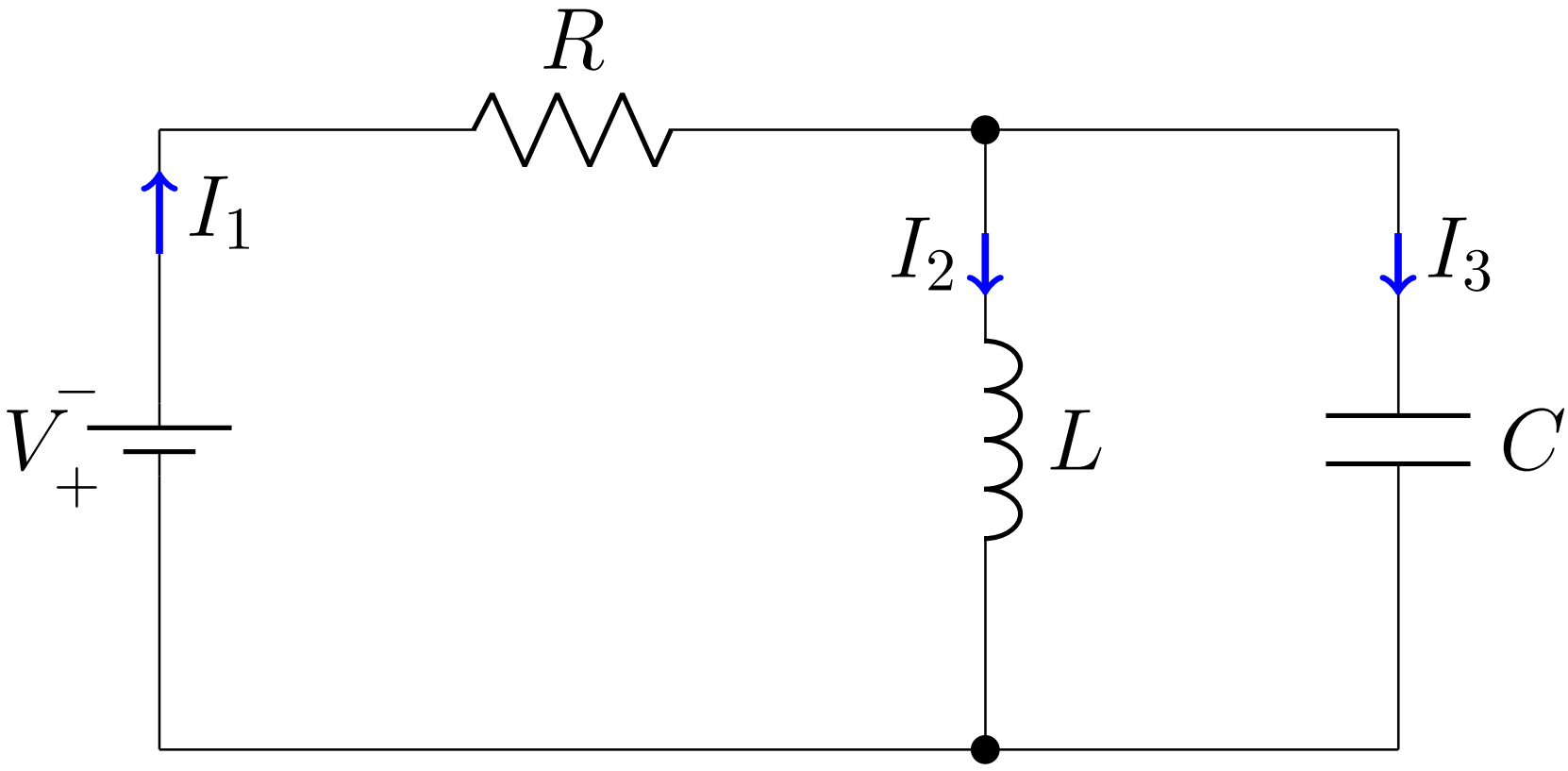

R_1
i_3
i_1
i_2
E
L_1
R_2
L_2

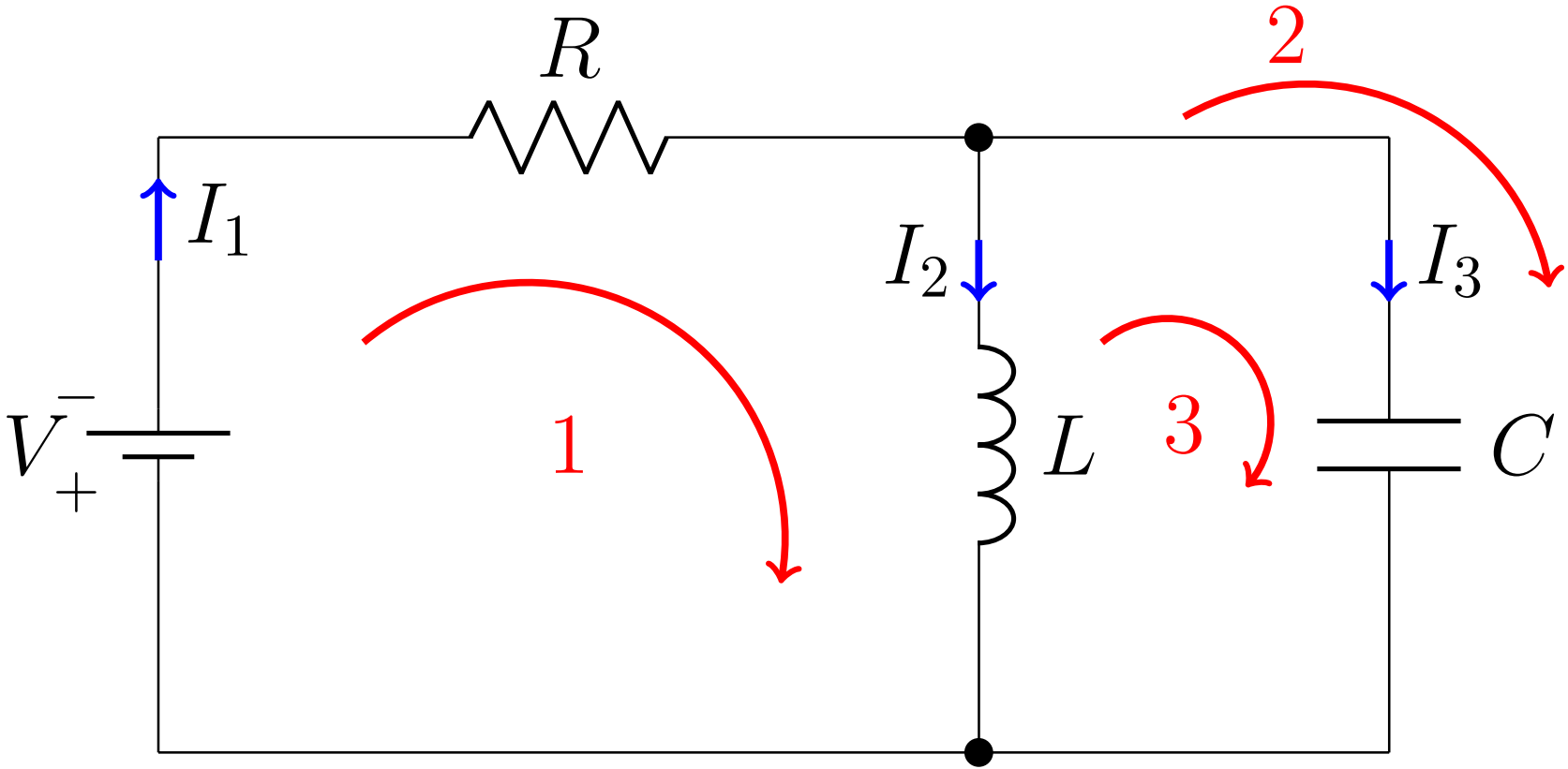

L_1
i_3
L_2
i_1
i_2
V
$-$
$+$
R_1
R_2

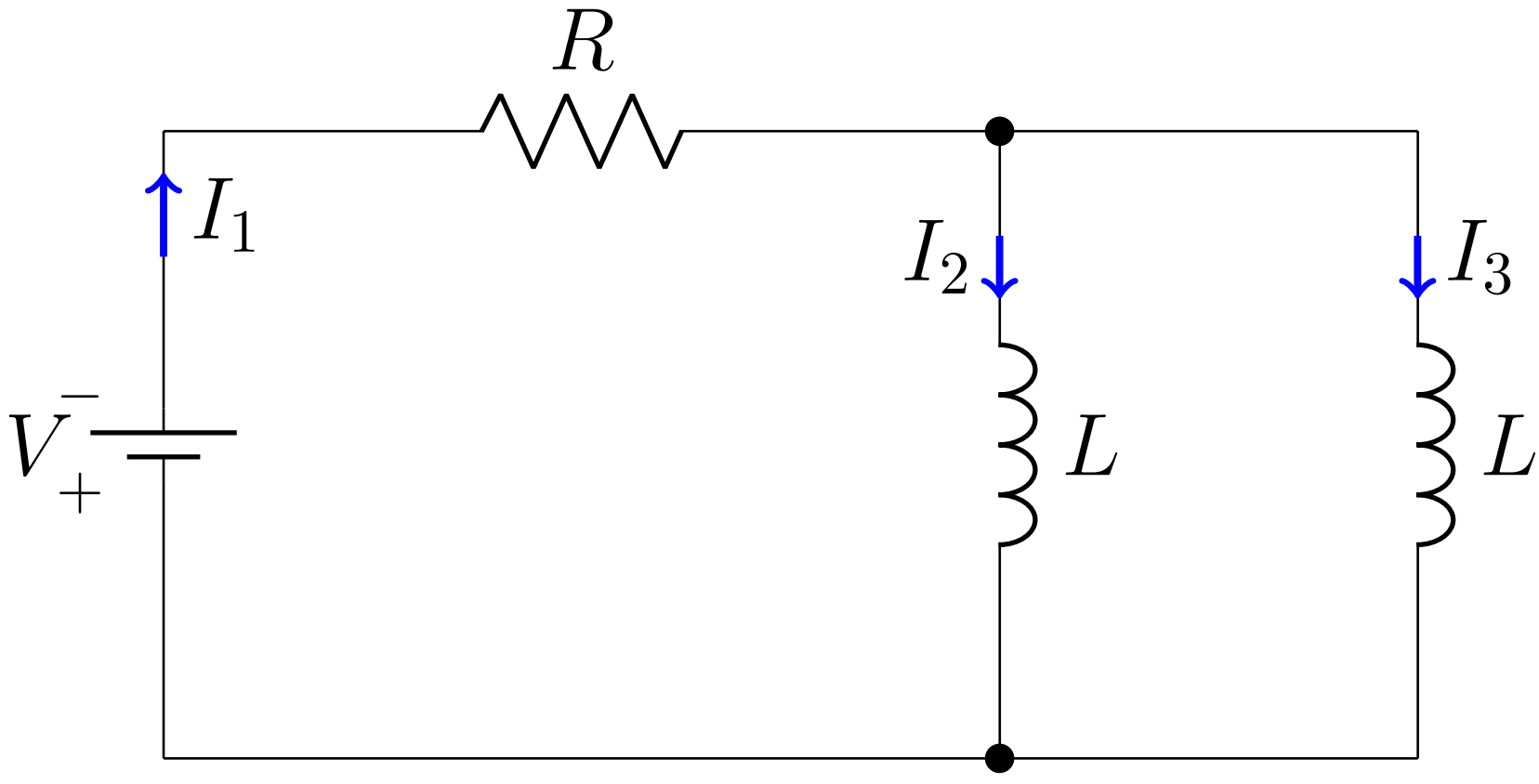

L_1
L_2
i_3
2
i_1
i_2
1
3
V
$-$
$+$
R_1
R_2

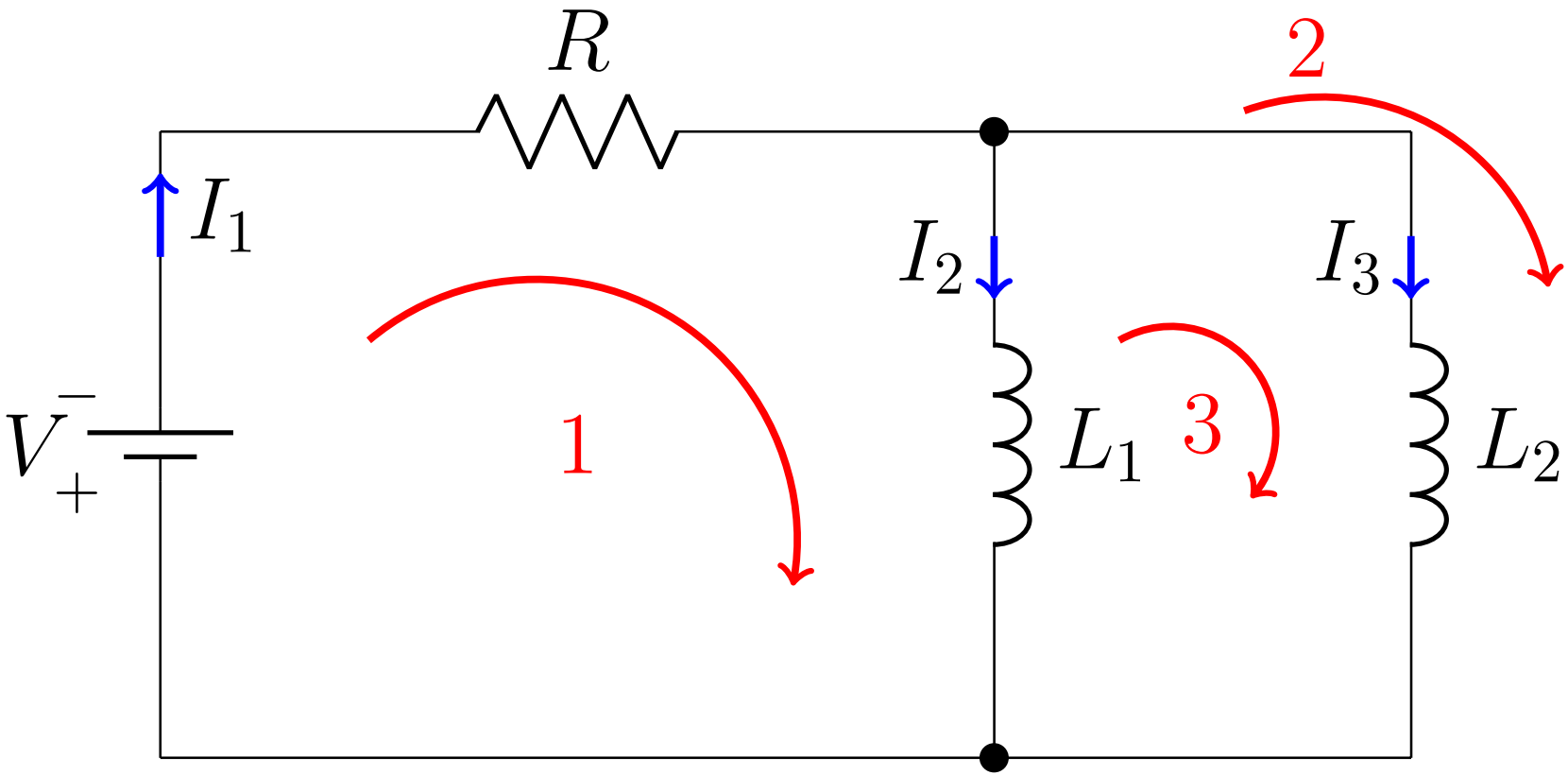

R_1
I_1
I_2
I_3
V
$-$
$+$
R_2
L_2
L_1
I_1

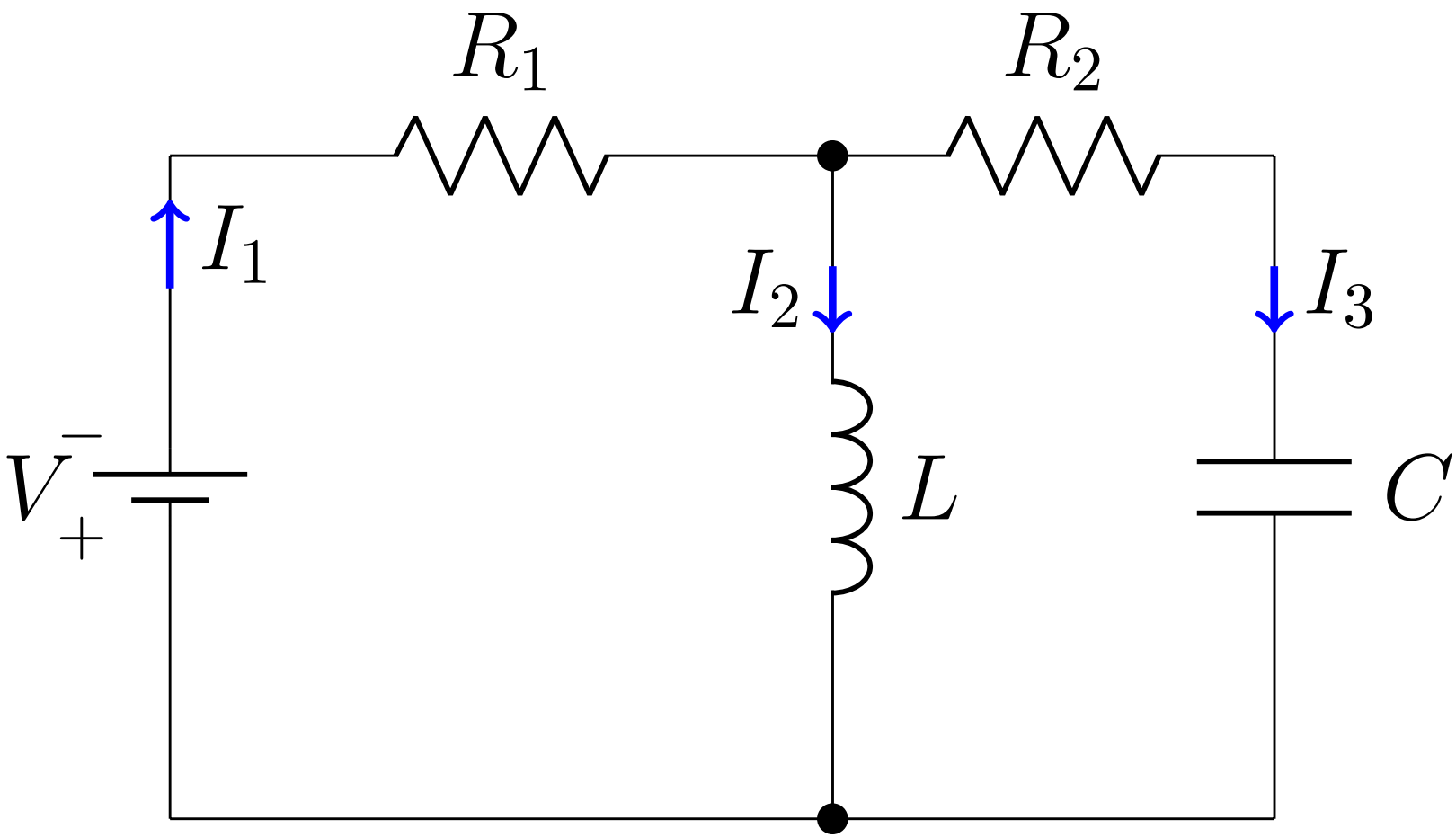

R_1
I_1
V
$-$
$+$
1
2
3
I_2
I_3
R_2
L_2
L_1
I_1

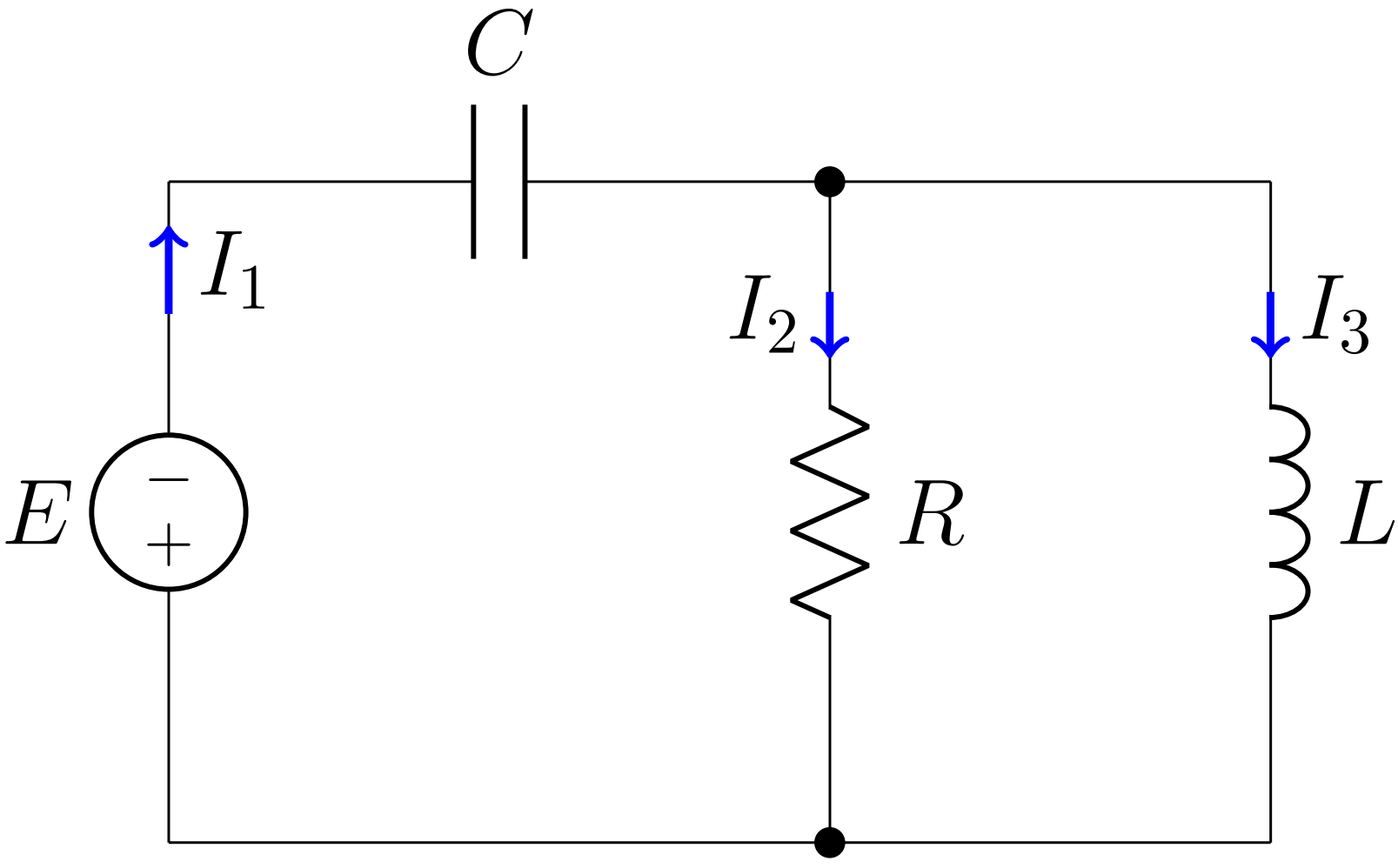

R
I1
I2
I3
V
−
+
L
C

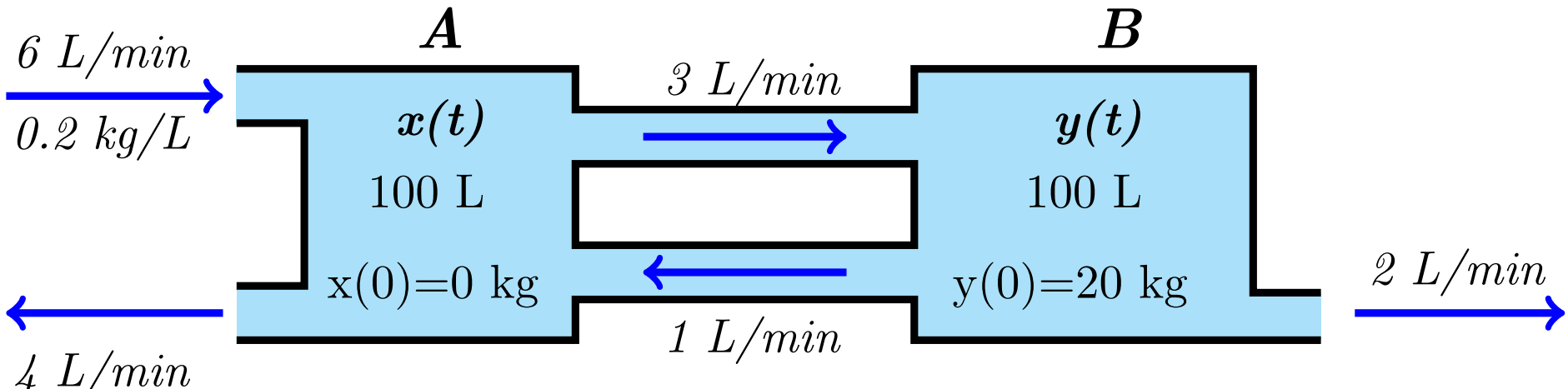

R
2
I1
I2
I3
V
−
+
1
L
3
C

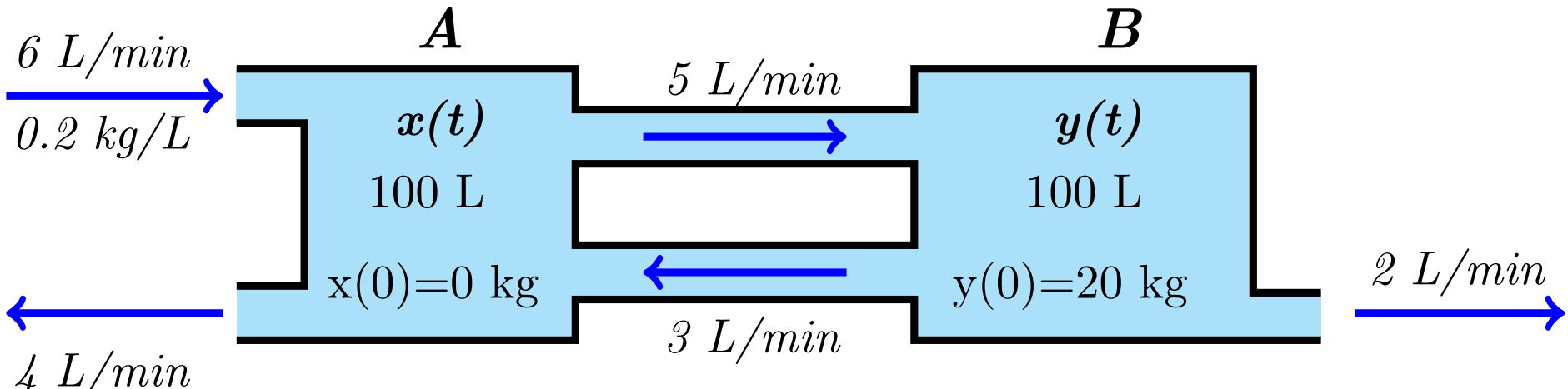

R
I1
I2
I3
V
−
+
L
L

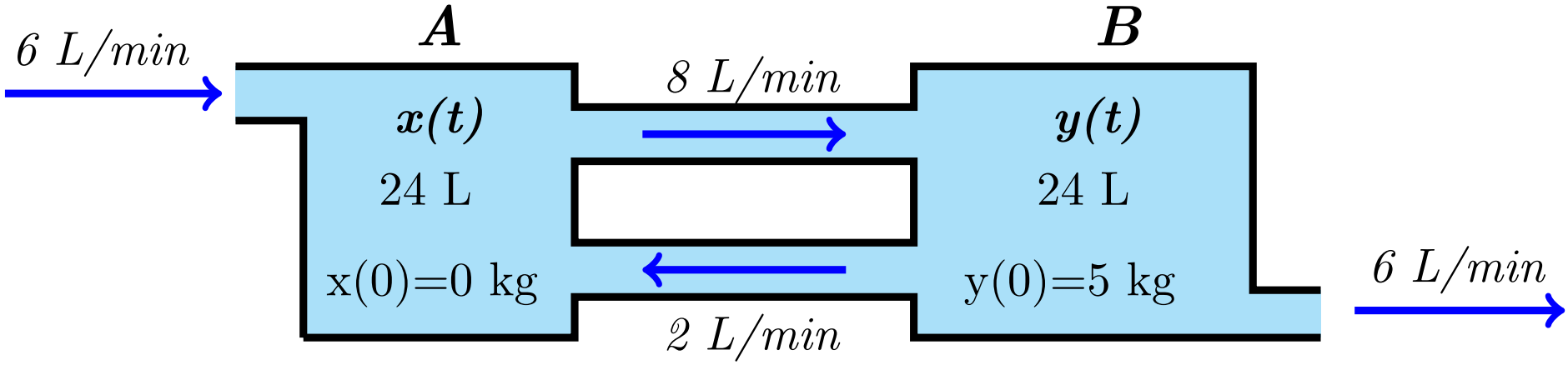

R
2
I1
I2
I3
1
3
V
L1
L2

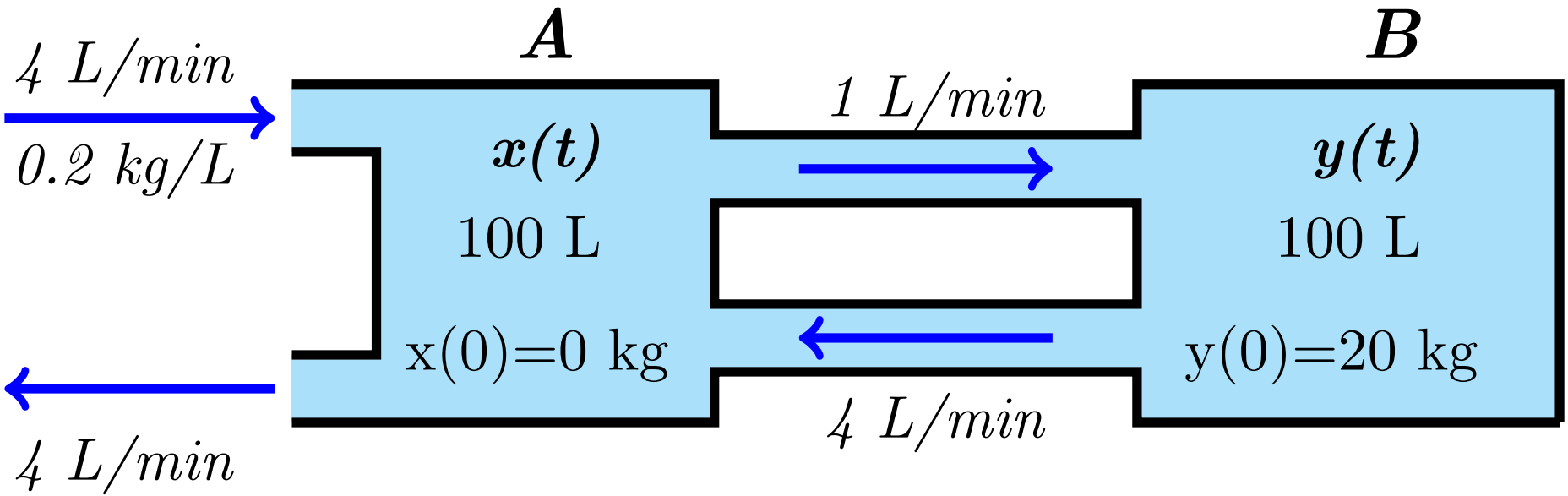

R_1
R_2
I_1
I_2
I_3
V
$-$
$+$
L
C

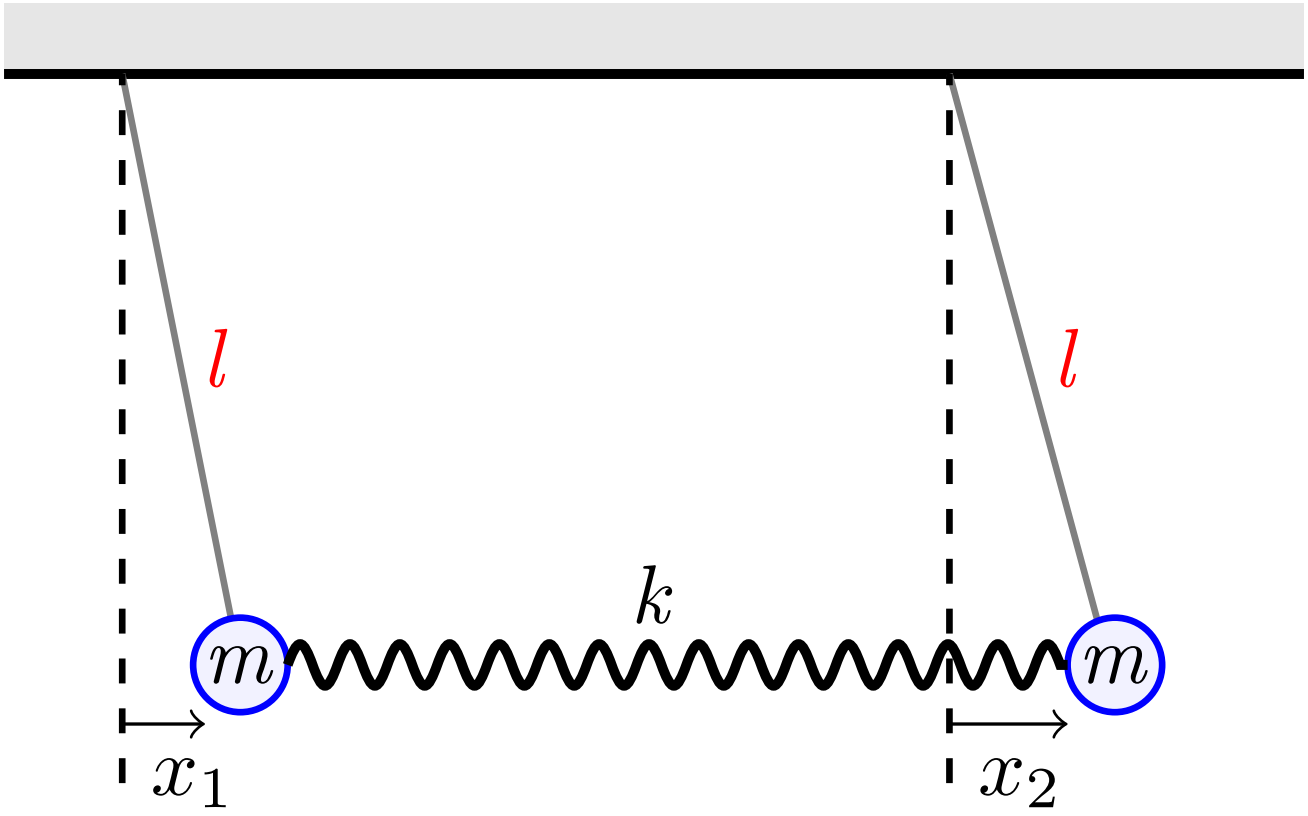

C
I1
I2
I3
E
R
L

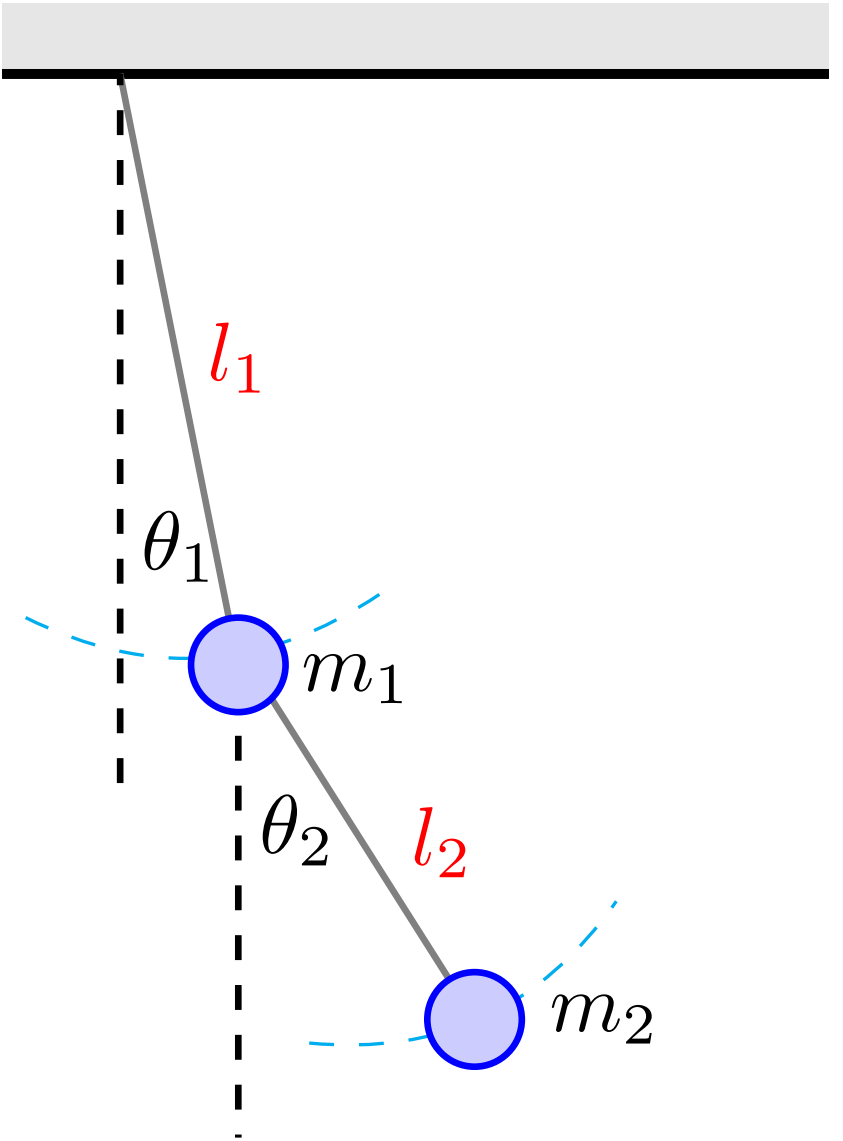

A
B
6 L/min
0.2 kg/L
3 L/min
x(t)
100 L
x(0)=0 kg
y(t)
100 L
y(0)=20 kg
2 L/min
4 L/min
1 L/min

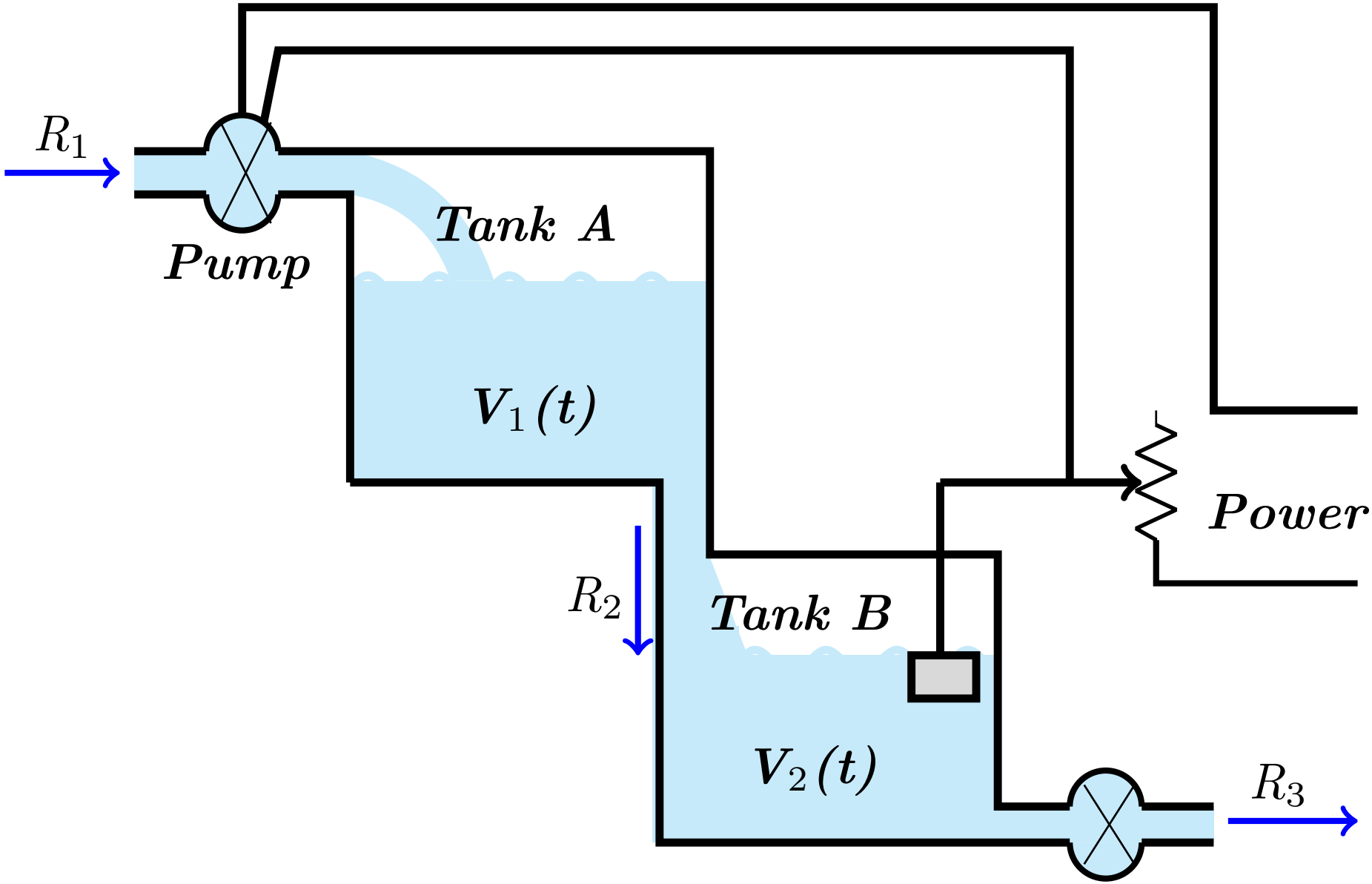

A
B
6 L/min
0.2 kg/L
5 L/min
x(t)
100 L
x(0)=0 kg
y(t)
100 L
y(0)=20 kg
2 L/min
4 L/min
3 L/min

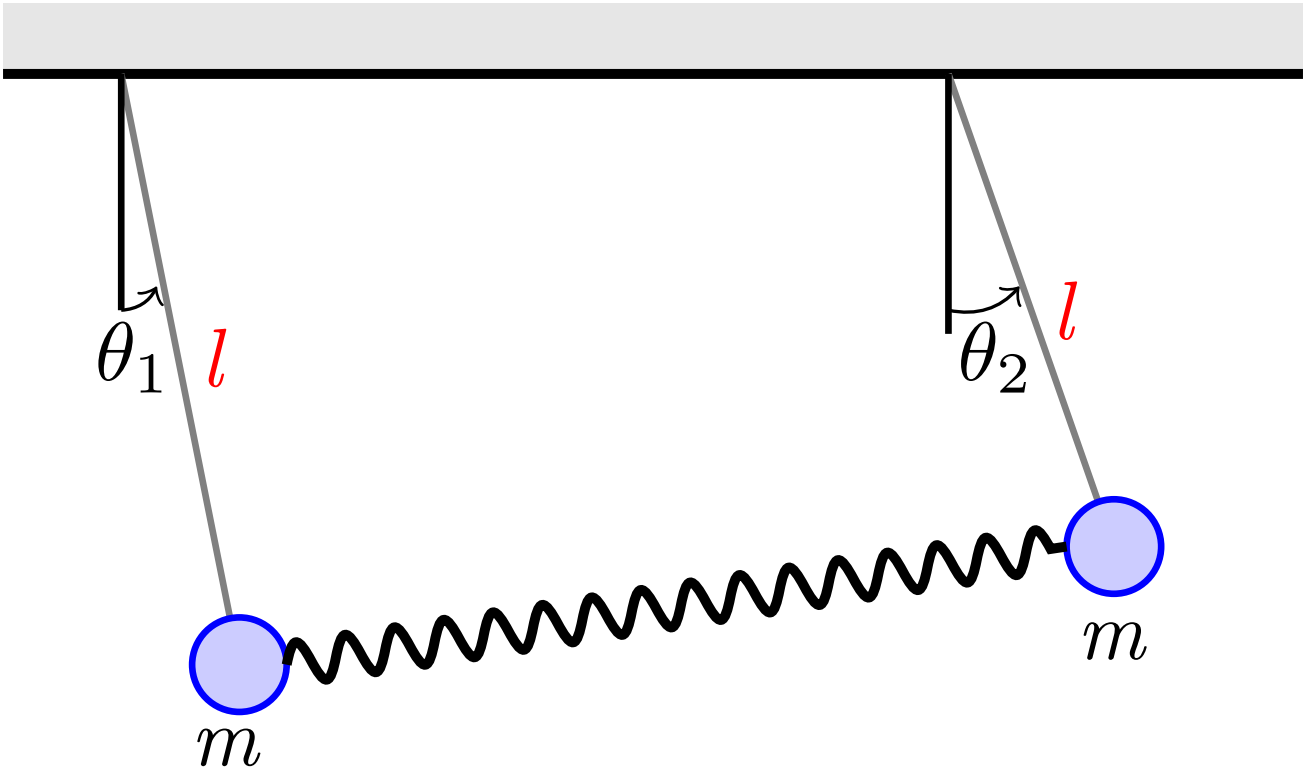

6 L/min
A
B
8 L/min
x(t)
y(t)
24 L
24 L
x(0)=0 kg
y(0)=5 kg
6 L/min
2 L/min

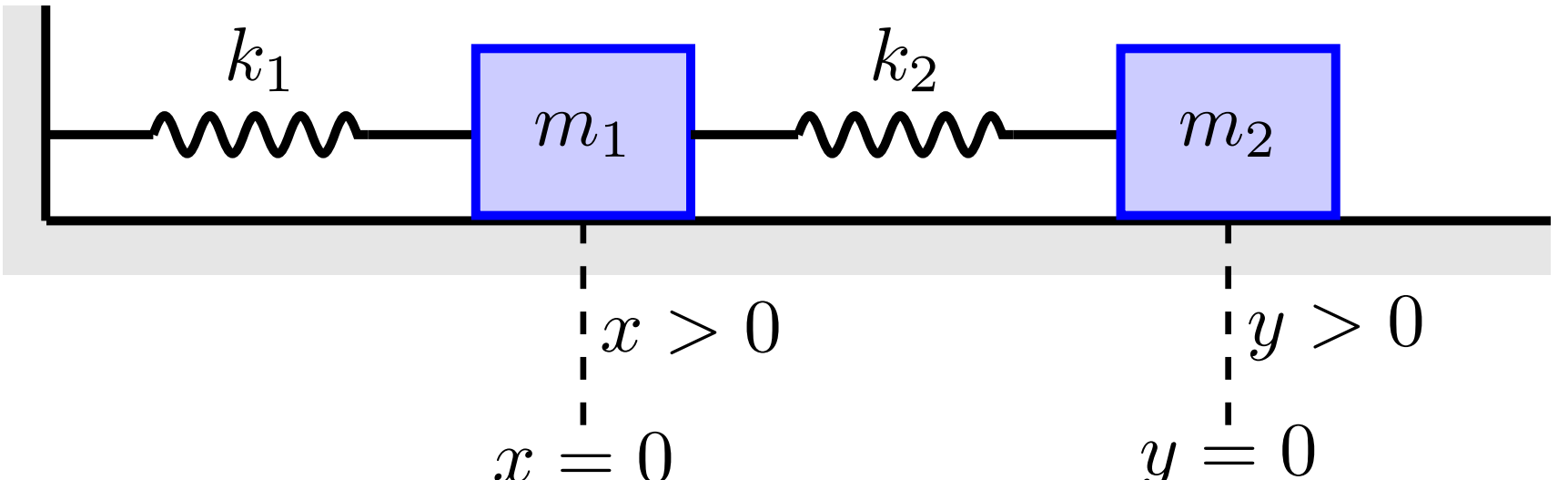

A
B
4 L/min
0.2 kg/L
1 L/min
x(t)
100 L
x(0)=0 kg
y(t)
100 L
y(0)=20 kg
4 L/min
4 L/min

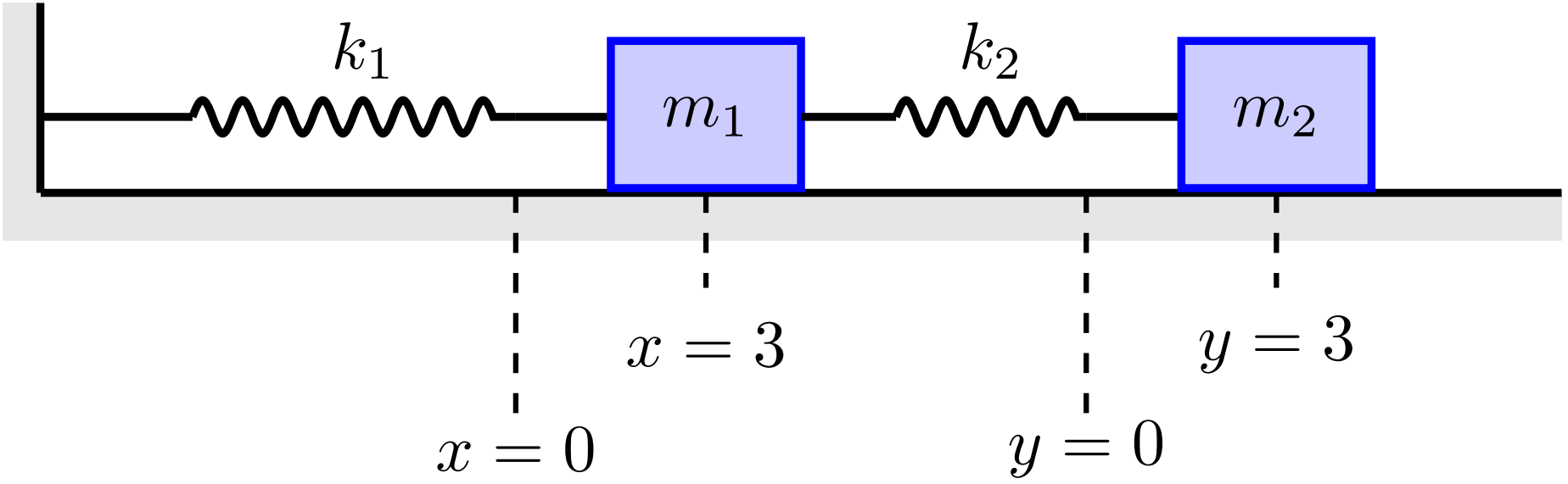

l
l
k
m
m
x_1
x_2

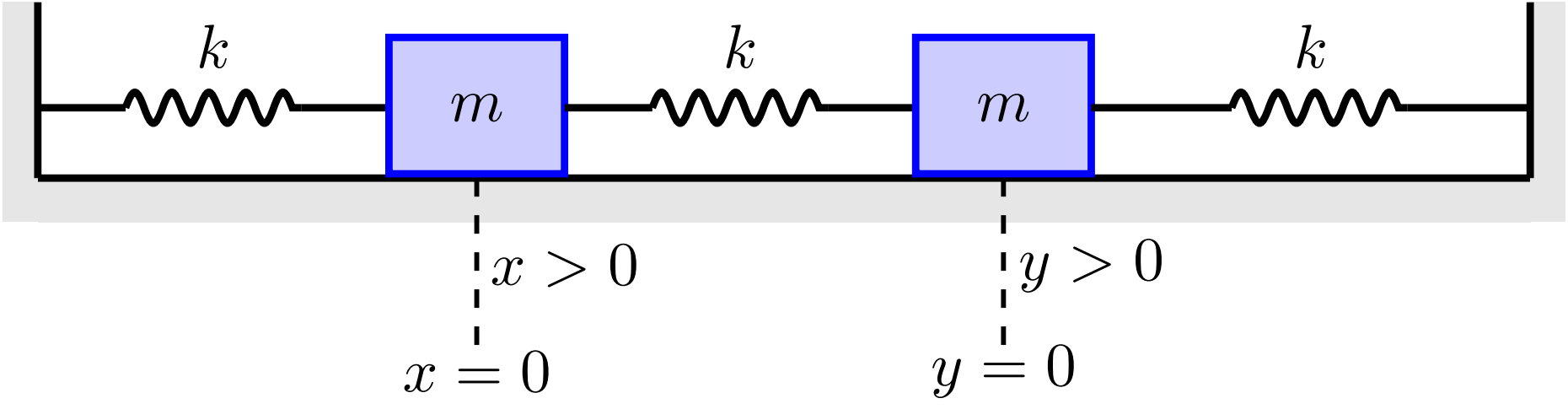

l_1
θ_1
m_1
θ_2
l_2
m_2

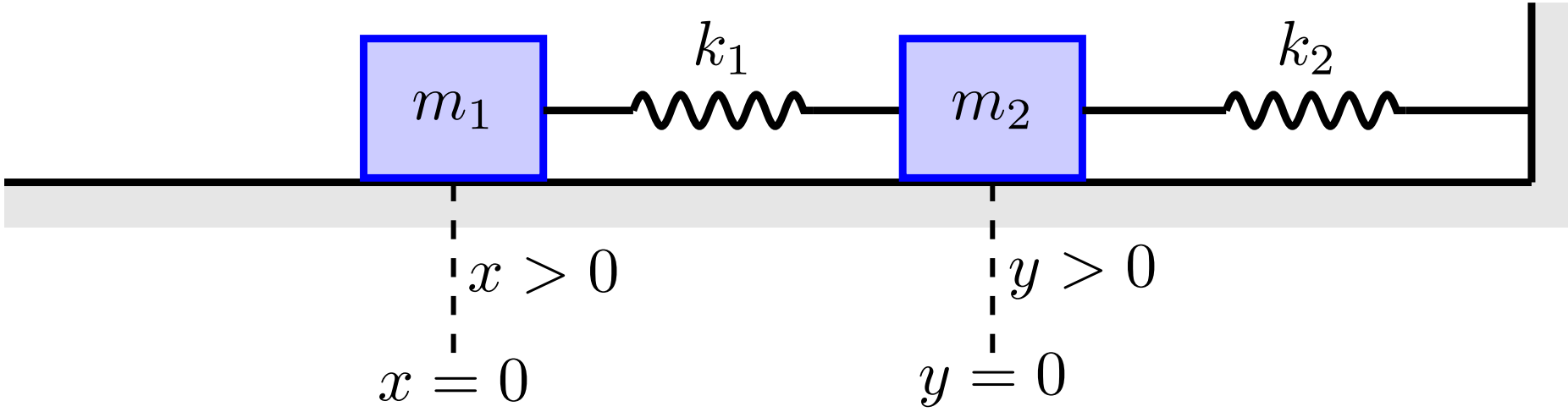

R_1
Pump
Tank A
$V_1(t)$
Power
R_2
Tank B
$V_2(t)$
R_3

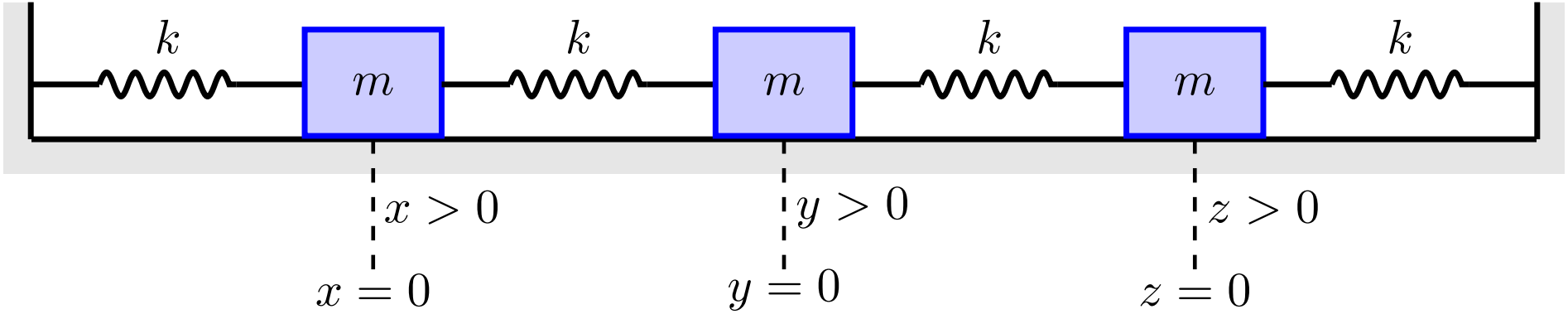

θ_1
l
θ_2
l
m
m

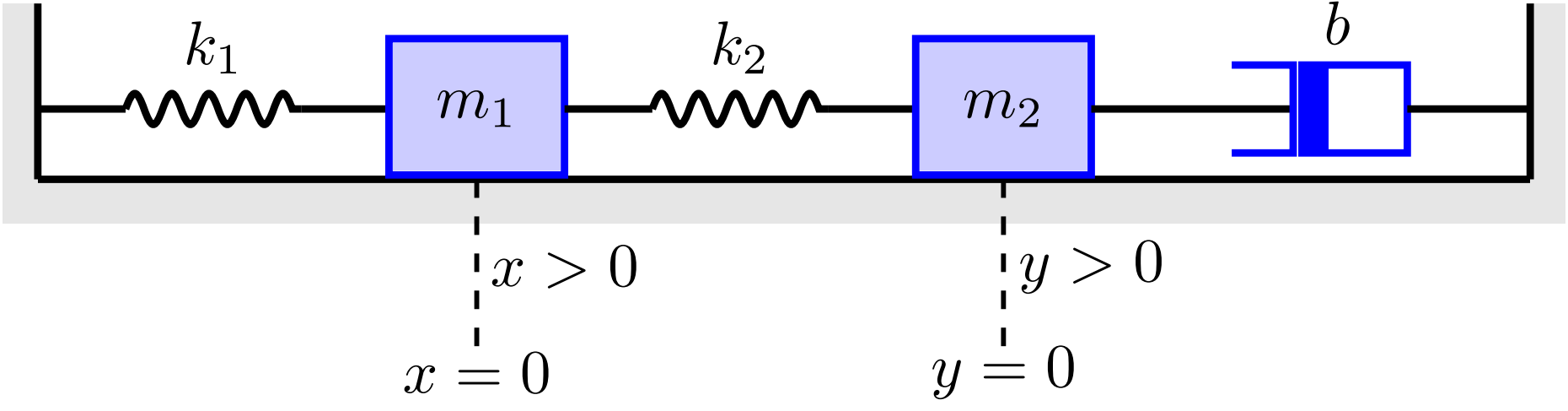

k_1
m_1
k_2
m_2
$x > 0$
$x = 0$
$y > 0$
$y = 0$

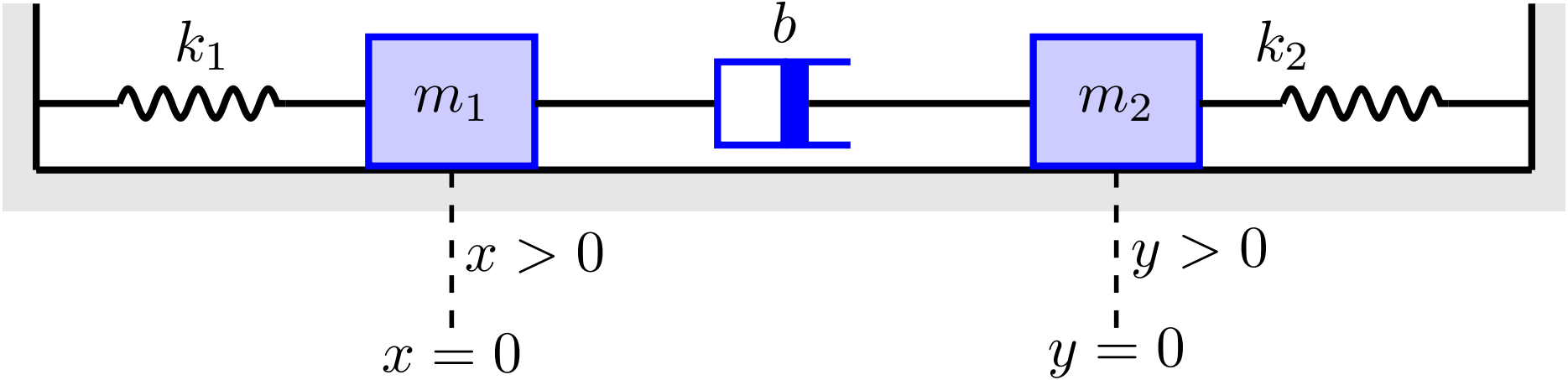

k_1
m_1
k_2
m_2
$x = 3$
$y = 3$
$x = 0$
$y = 0$

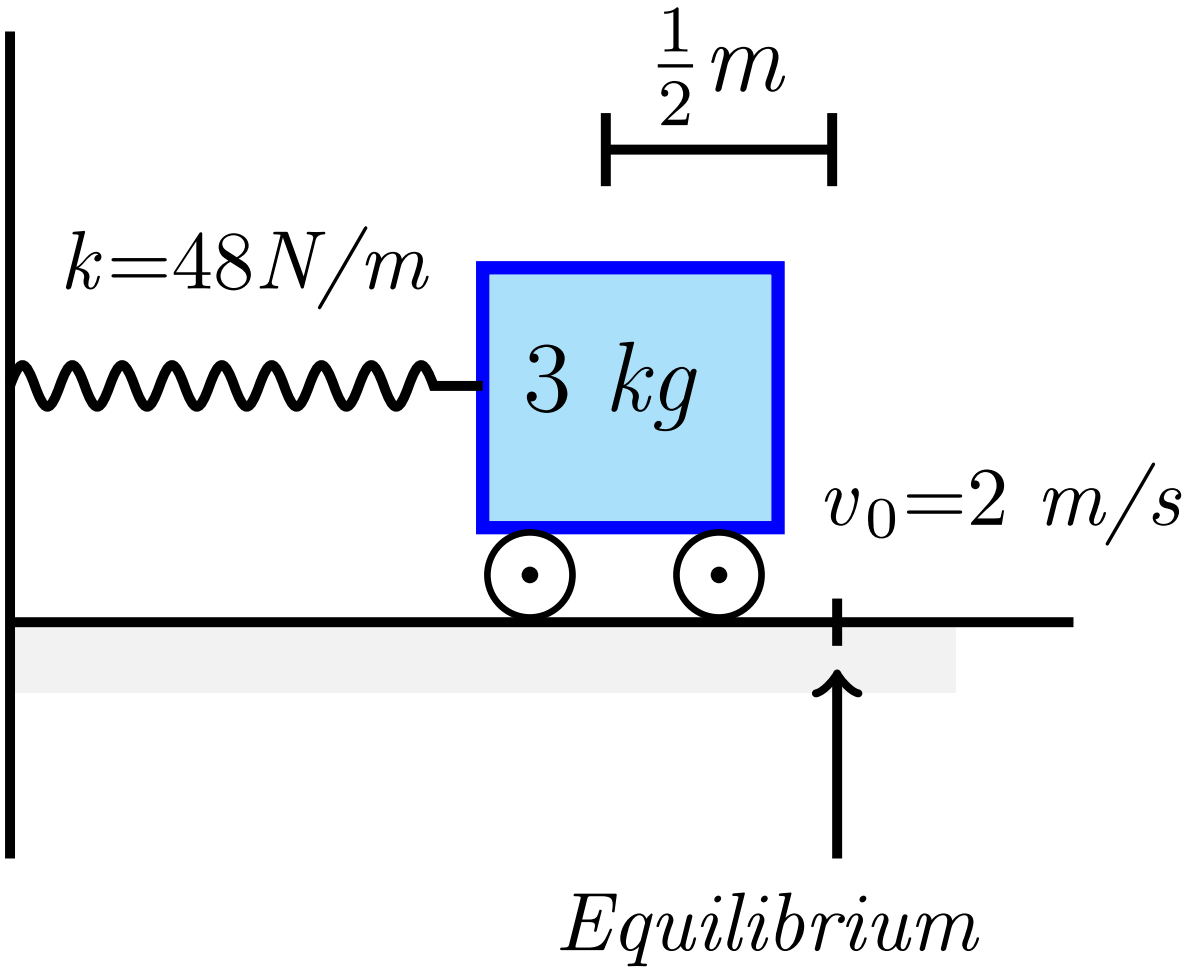

k
m
k
m
k
x > 0
y > 0
x = 0
y = 0

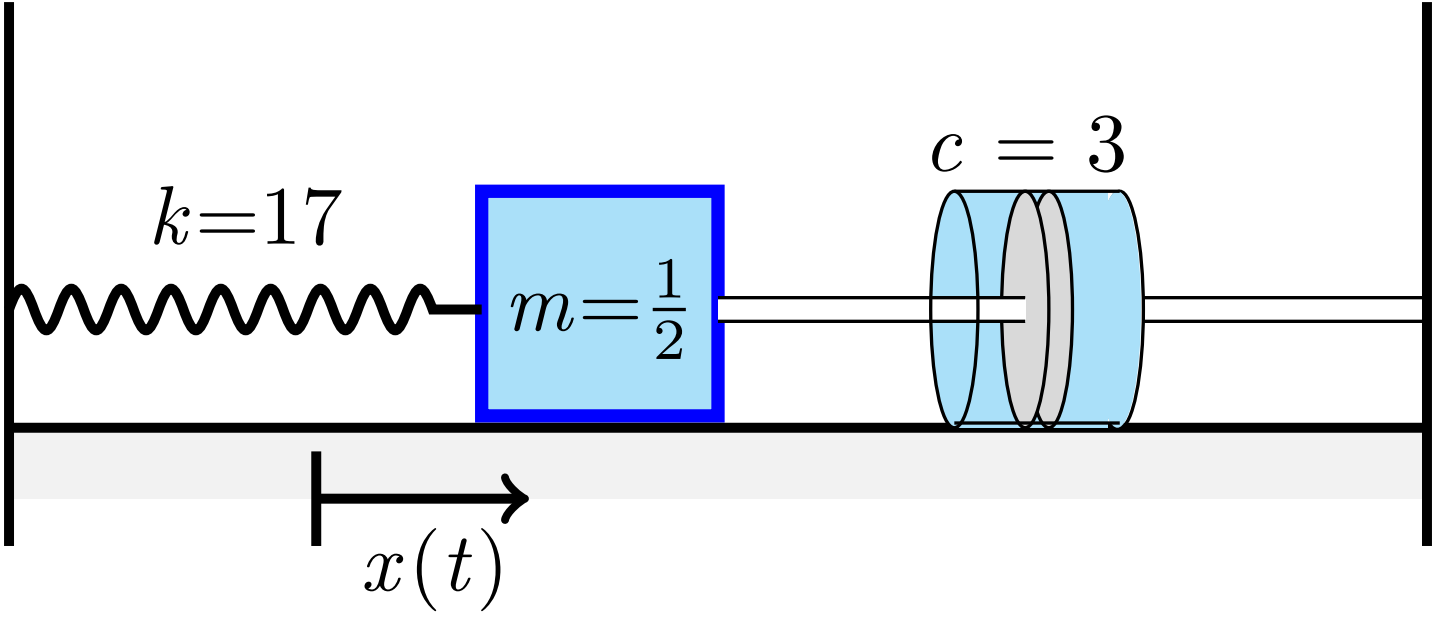

m_1
k_1
m_2
k_2
$x > 0$
$x = 0$
$y > 0$
$y = 0$

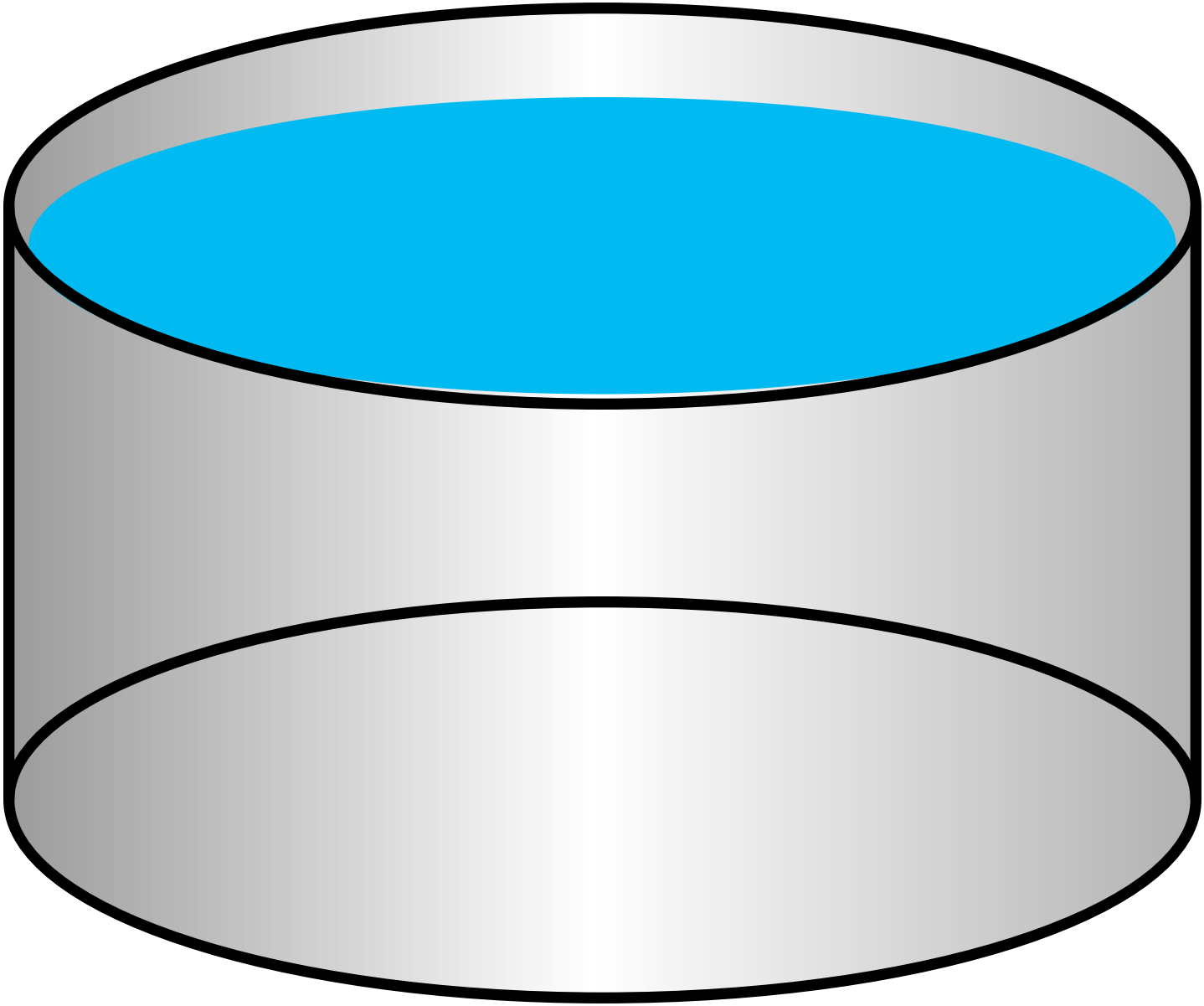

k
m
k
m
k
m
k
x > 0
y > 0
z > 0
x = 0
y = 0
z = 0

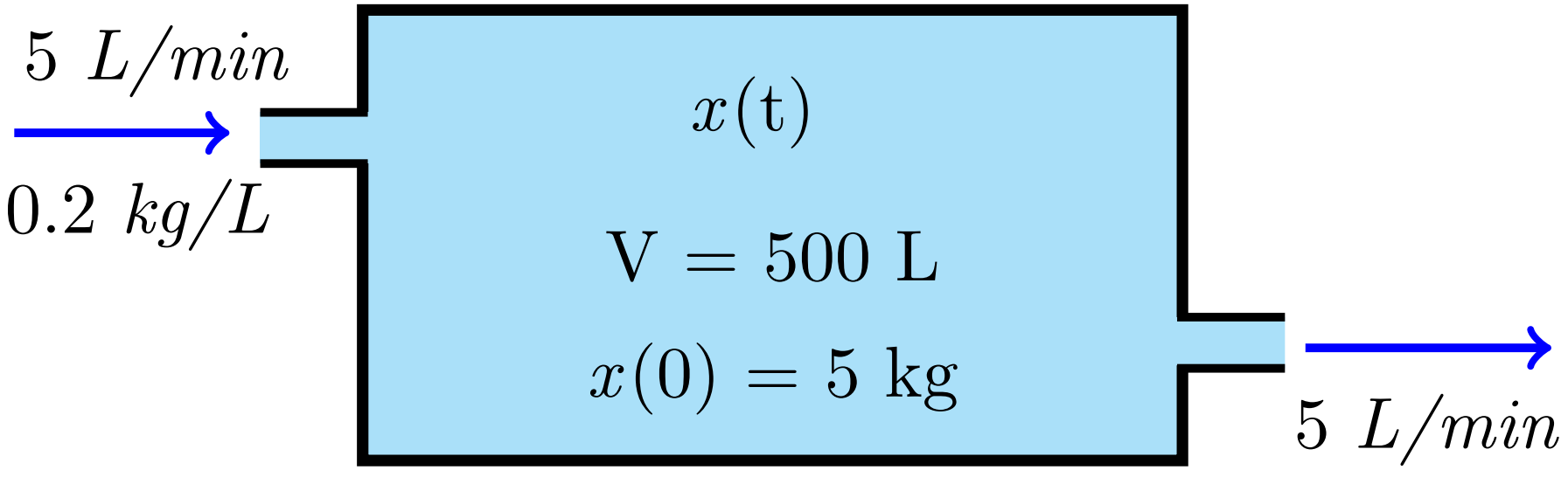

k_1
m_1
k_2
m_2
b
$x > 0$
$x = 0$
$y > 0$
$y = 0$

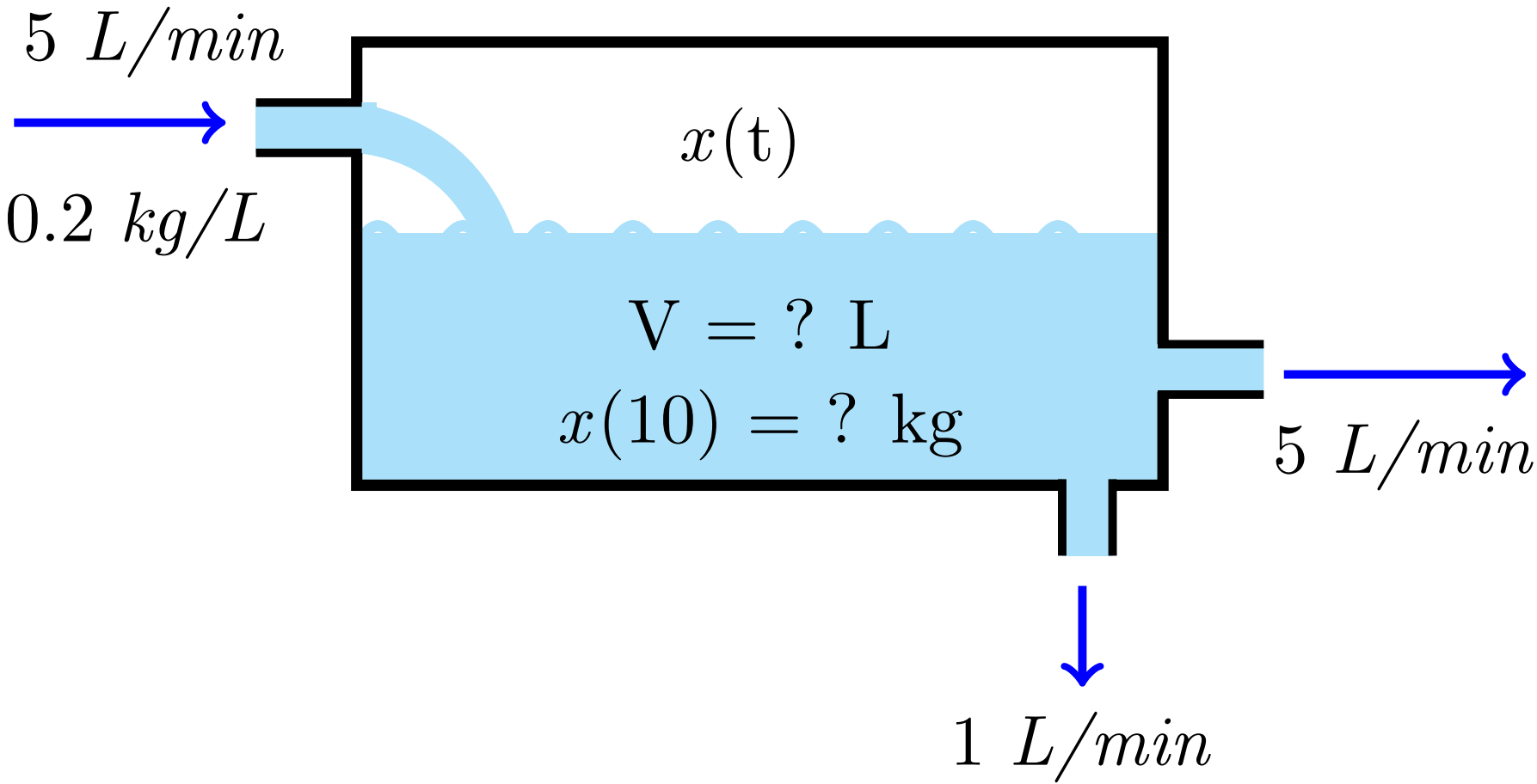

k_1
m_1
b
m_2
k_2
$x > 0$
$x = 0$
$y > 0$
$y = 0$


$\frac{1}{2}m$
$k{=}48N/m$
$3\ kg$
$v_0{=}2\ m/s$
$Equilibrium$


$c = 3$
$k{=}17$
$m{=}\frac{1}{2}$
$x(t)$




5 L/min
0.2 kg/L
x(t)
V = 500 L
x(0) = 5 kg
5 L/min


5 L/min
0.2 kg/L
x(t)
V = ? L
x(10) = ? kg
5 L/min
1 L/min