

## S1. Full Program for Figure 1B

```
main
call cycle 100 <calls the function "cycle" 100 times>
end

cycle
open(C1)
open(D1)
call wait
open(C2)
call wait
close(C1)
close(D1)
call wait
open(B1)
call wait
close(C2)
call wait
close(B1)
call wait
end

wait
w250 <waits for 250 ms before proceeding to the next step>
end
```

B2 is fluttered continuously in a separate program that runs simultaneously.

## S2. Program 1: Mixing program illustrated in Figure 4

F(A3)	Flutter valve A3
[C(d2,d4 → C3)	Combine fluorescein and ROX in C3
T((C3 → a1)1]250	Transfer to a1 and repeat 250 times

## S3. Program 2: Serial dilution program illustrated in Figure 5

Out 1: [C(c1, d2 → B2, C2), T(B2,C2 → b1)2]60	Combine dye and buffer to produce Out1
Out 2: [C(b1, d2 → B2, C2), T(B2,C2 → a1)2]60	Combine Out1 and buffer to produce Out2
Out 3: [C(a1, d2 → B2, B3), T(B2,B3 → d3)2]60	Combine Out2 and buffer to produce Out3
Out 4: [C(d3, d2 → B3, B4), T(B3,B4 → d4)2]60	Combine Out3 and buffer to produce Out4

## S4. Program 3: CZE sample preparation program illustrated in Figure 6

[C(c1,d2,d4→ C2)	Combine EDC, Cascade Blue, and sample.
T((C2 → a1)1]250	Transfer to Output 1.
Store 15 min	
[C(a1,d2→ B2,B3)	Combine one unit buffer and one unit reacted product.
T(B2,B3 → b1)2	Transfer to Output 2.
T(d3→b1)1]250	Transfer 1 unit buffer to Output 2.

### S.5 Proportions Loaded to the Combining Valve in the 6-bit Combinatorial Mixing Device for Inputs 1-3

Binary Sequence	%Input 1	%Input 2	%Input 3	Binary Sequence	%Input 1	%Input 2	%Input 3
100000	100	0	0	100001	52	0	0
010000	0	100	0	010001	0	56	0
110000	48	52	0	110001	32	32	0
001000	0	0	100	001001	0	0	54
101000	49	0	50	101001	35	0	16
011000	0	52	47	011001	0	38	31
111000	33	34	30	111001	22	24	22
000100	0	0	0	000101	0	0	0
100100	38	0	0	100101	32	0	0
010100	0	54	0	010101	0	39	0
110100	22	33	0	110101	28	25	0
001100	0	0	38	001101	27	0	0
101100	22	0	20	101101	30	0	25
011100	0	39	24	011101	0	38	21
111100	22	30	20	111101	21	22	12
000010	0	0	0	000011	0	0	0
100010	48	0	0	100011	27	0	0
010010	0	63	0	010011	0	36	0
110001	30	43	0	110011	21	22	0
001010	0	0	35	001011	0	0	40
101010	36	0	24	101011	23	0	15
011010	0	53	28	011011	0	38	21
111010	16	40	16	111011	20	20	11
000110	0	0	0	000111	0	0	0
100110	32	0	0	100111	26	0	0
010110	0	47	0	010111	0	36	0
110110	28	29	0	110111	24	21	0
001110	0	0	32	001111	0	0	25
101110	28	0	24	101111	23	0	17
011110	0	38	21	011111	0	33	20
111110	20	18	12	111111	19	25	11
000001	0	0	0	000000	0	0	0