- Calculate the SLD of a cellulose hydrogel, as well as the SLD of the sample when soaked in different H2O/D2O mixtures. (Assume that we only have crystalline cellulose, which has a physical density of 1.6 g/cm^3).

SLD Cellulose H2O	
SLD Cellulose D2O	
SLD Cellulose 60%D2O	
SLD Cellulose 35%D2O	
SLD Cellulose 20%D2O	

- The values obtained above assume that 100% of the labile OH groups in cellulose have been exchanged, which is typically not true. Now, estimate how the SLD would change in the different H2O/D2O mixtures assuming different degrees of OH/OD exchange.

OH/OD degree of exchange (%)	D2O in solvent mixture (%)	SLD Cellulose
0	0	
0	0.2	
0	0.35	
0	0.6	
0	1	
1	0	
1	0.2	
1	0.35	
1	0.6	
1	1	
0.5	0	
0.5	0.2	
0.5	0.35	
0.5	0.6	
0.5	1	
0.2	0	
0.2	0.2	
0.2	0.35	
0.2	0.6	
0.2	1	
0.8	0	
0.8	0.2	
0.8	0.35	
0.8	0.6	
0.8	1	

- Now do the same calculations for a different polysaccharide which is also typically found in gels: agarose. (The physical density of agarose is 1.7 g/cm^3).

SLD Agarose H2O	
SLD Agarose D2O	
SLD Agarose 60%D2O	
SLD Agarose 35%D2O	
SLD Agarose 20%D2O	

OH/OD degree of exchange (%)	D2O in solvent mixture (%)	SLD Agarose
0	0	
0	0.2	
0	0.35	
0	0.6	
0	1	
1	0	
1	0.2	
1	0.35	
1	0.6	
1	1	
0.5	0	
0.5	0.2	
0.5	0.35	
0.5	0.6	
0.5	1	
0.2	0	
0.2	0.2	
0.2	0.35	
0.2	0.6	
0.2	1	
0.8	0	
0.8	0.2	
0.8	0.35	
0.8	0.6	
0.8	1	

Note: The molecular formula of cellulose is $(C_6H_{10}O_5)_n$ while for agarose it is $(C_{12}H_{18}O_9)_n$