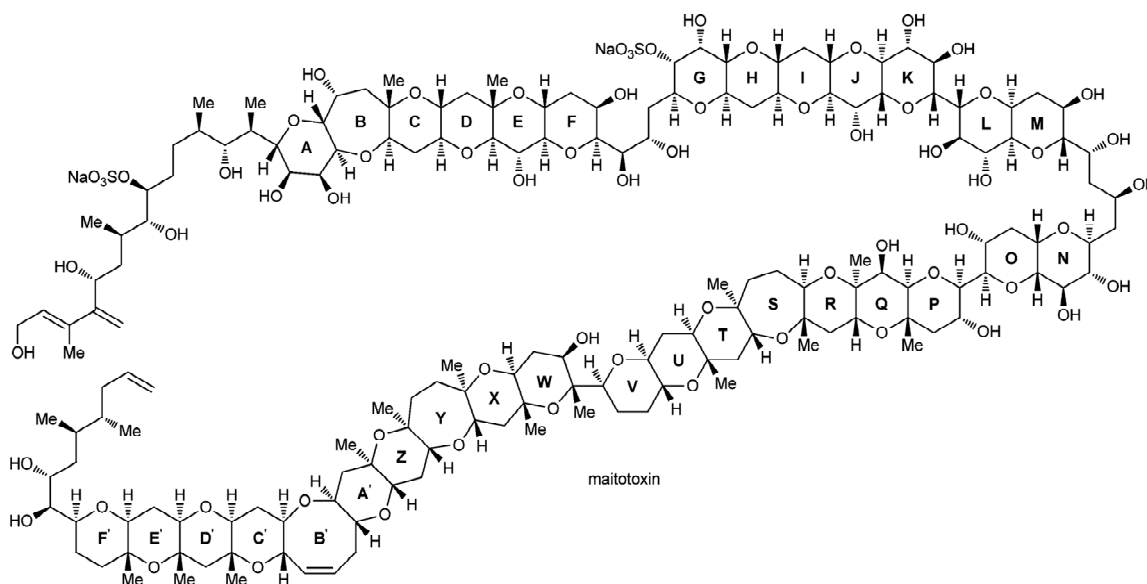


2. The marine natural product maitotoxin has a molecular formula $C_{164}H_{256}O_{68}S_2Na_2$. In the *negative ion* FAB mass spectrum, maitotoxin shows a peak associated with loss of a sodium cation Na^+ to give the $[C_{164}H_{256}O_{68}S_2Na]^-$ anion. (In the negative ion mode, anions are observed, rather than cations.) (10 points)



a. What is the m/z ratio of the $[^{12}C_{164}^{1}H_{256}^{16}O_{68}^{32}S_2^{23}Na]^-$ isotopomer of the $[C_{164}H_{256}O_{68}S_2Na]^-$ ion? _____

Please show your work below.

TABLE 1.4 Exact Masses of Isotopes.

Element	Atomic Weight	Nuclide	Mass
Hydrogen	1.00794	1H	1.00783
		$D(^2H)$	2.01410
Carbon	12.01115	^{12}C	12.00000 (std)
		^{13}C	13.00336
Nitrogen	14.0067	^{14}N	14.0031
		^{15}N	15.0001
Oxygen	15.9994	^{16}O	15.9949
		^{17}O	16.9991
		^{18}O	17.9992
		^{19}F	18.9984
Fluorine	18.9984	^{19}F	18.9984
Sodium	22.9898	^{23}Na	22.9898
Silicon	28.0855	^{28}Si	27.9769
		^{29}Si	28.9765
		^{30}Si	29.9738
		^{31}P	30.9738
		^{32}S	31.9721
Phosphorus	30.9738	^{32}S	31.9721
		^{33}S	32.9715
		^{34}S	33.9679
Sulfur	32.0660	^{35}Cl	34.9689
		^{37}Cl	36.9659
Chlorine	35.4527	^{35}Cl	34.9689
		^{37}Cl	36.9659
Bromine	79.9094	^{79}Br	78.9183
		^{81}Br	80.9163
Iodine	126.9045	^{127}I	126.9045

b. What is the isotopic composition of the predominant isotopomer of the $[C_{164}H_{256}O_{68}S_2Na]^-$ ion? _____

If you are uncertain among a couple of possibilities, explain below.

c. What is the formula of the cation that would you expect to observe in the positive ion ESI mass spectrum of maitotoxin? _____

d. What is the m/z ratio of the ^{12}C , 1H , ^{16}O , ^{32}S , ^{23}Na isotopomer of that cation? _____