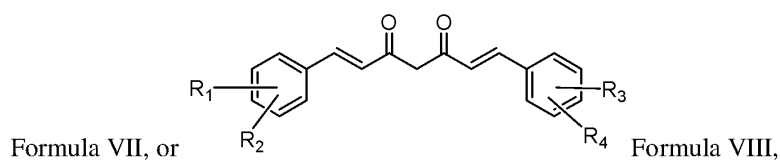
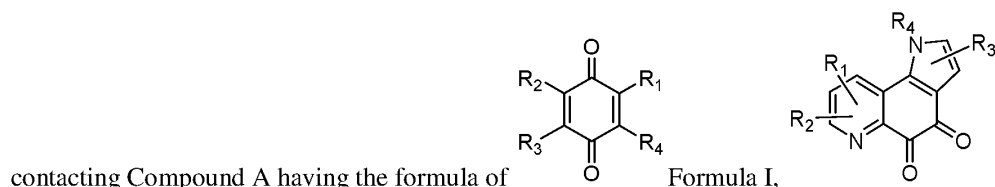
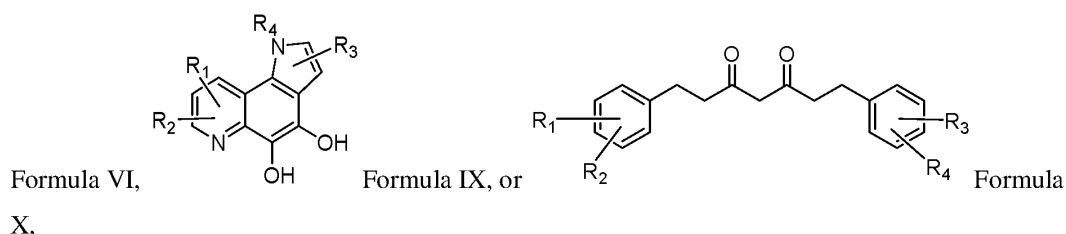
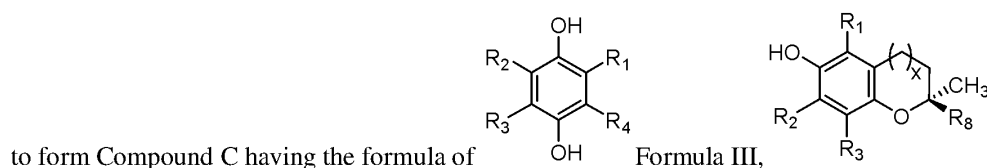
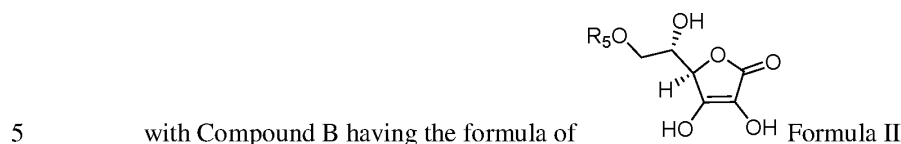


What Is Claimed Is:

1. A method of preparing a composition comprising Compound C, comprising:



optionally in a solvent, wherein the solvent is free of ethanol,



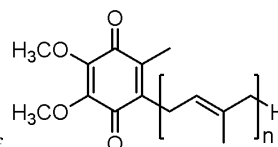
wherein:

- 10 R₅ is H, OH, NH₂, NO₂, R₆-C(O)-, optionally substituted carbocycle, optionally substituted aryl group, optionally substituted heteroaryl group, branched or unbranched alkyl alcohol, halo, branched or unbranched alkyl, branched or unbranched alkenyl, branched or unbranched alkenyl ester, amide, cyano, alkoxy, haloalkyl, alkylsulfonyl, nitrite, or alkylsulfanyl;
- x is 0-6; and
- 15 R₁, R₂, R₃, R₄, R₆, and R₈ are each, independently, H, OH, NH₂, NO₂, optionally substituted carbocycle, optionally substituted aryl group, optionally substituted heteroaryl group, branched or unbranched alkyl alcohol, halo, branched or unbranched alkyl, branched or unbranched alkenyl

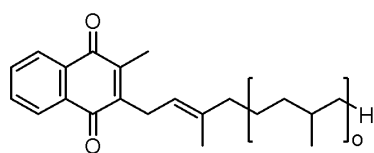
branched or unbranched carboxylic acid, branched or unbranched alkyl ester, branched or unbranched alkenyl ester, amide, cyano, alkoxy, haloalkyl, alkylsulfonfyl, nitrite, or alkylsulfanyl; or R_2 and R_3 are together optionally substituted cycloalkyl, optionally substituted cycloheteroalkyl, optionally substituted aryl, or optionally substituted heteroaryl.

5

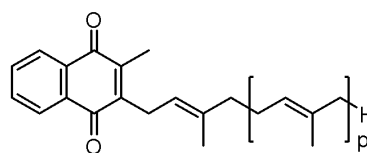
2. The method of claim 1, wherein Compound A has the formula of



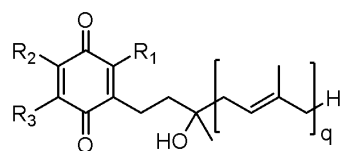
Formula I-I,



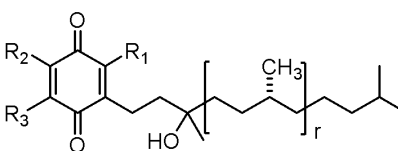
Formula I-II,



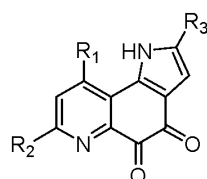
Formula I-III,



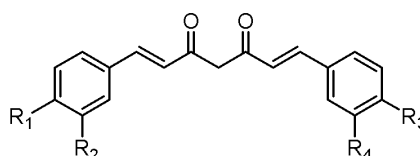
Formula I-IV,



Formula I-V,



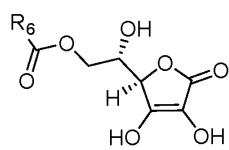
Formula VII-I, or



Formula

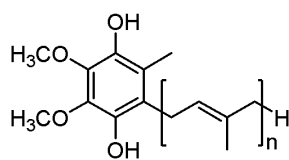
10 VIII-I, wherein n , o , p , q , and r are each, independently, 1-20 and the rest variables are as defined in claim 1.

3. The method of any one of claims 1-2, wherein Compound B has the formula of

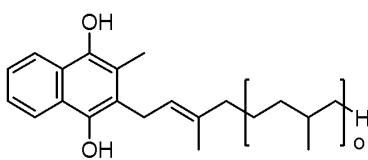
Formula II-I, wherein R_6 is as defined in claim 1.

15

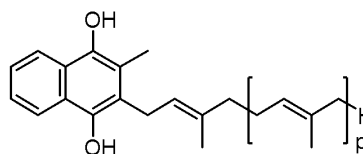
4. The method of any one of claims 1-3, wherein Compound C has the formula of



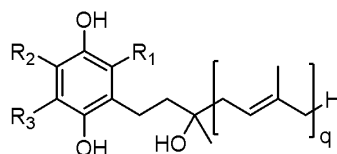
Formula III-I,



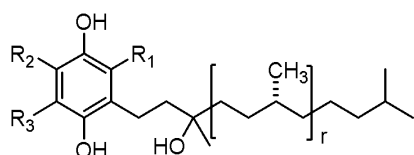
Formula III-II,



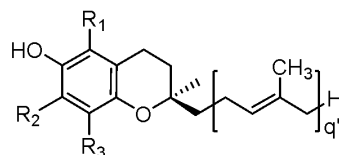
Formula III-III,



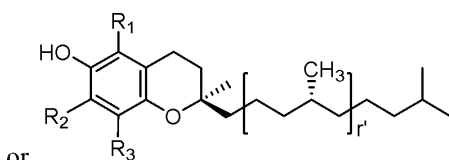
Formula III-IV,



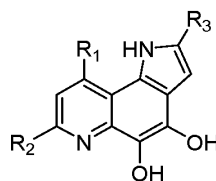
Formula III-V,



Formula VI-I,

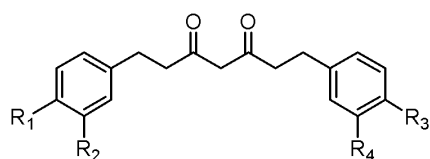


Formula VI-II,



Formula VII-II, or

5 or

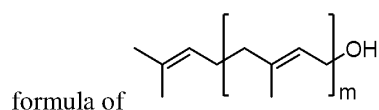


Formula VIII-II,

wherein r' and q' are each, independently, 1-20 and the rest variables are as defined in claim

1 the variables are as defined in claims 1-2.

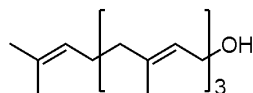
10 5. The method any one of claims 1-4, wherein the solvent is a non-toxic terpenoid having the



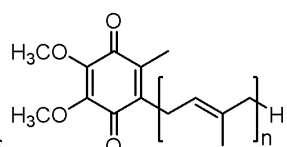
formula of

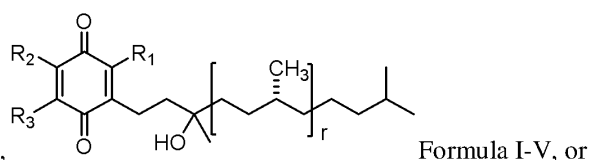
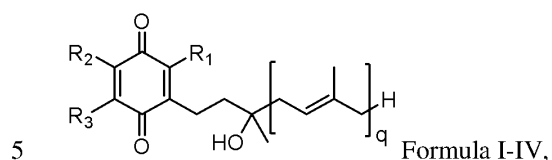
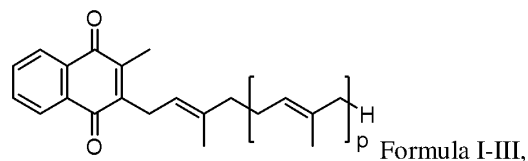
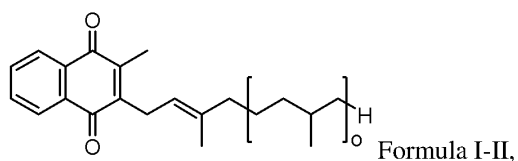
Formula V and m is 0-10.

6. The method of claim 5, wherein the non-toxic terpenoid has the formula of

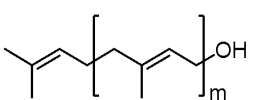


7. The method of claim 1, wherein the method comprises:

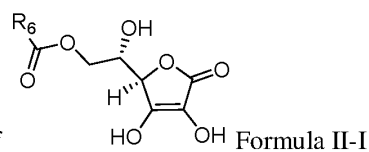
contacting Compound A having the formula of  Formula I-I,



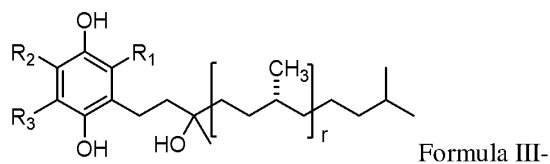
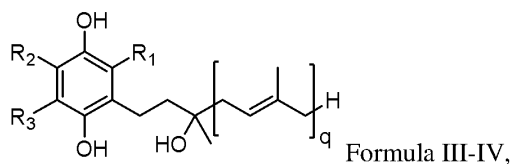
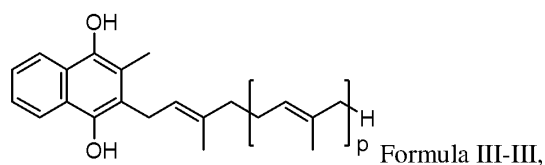
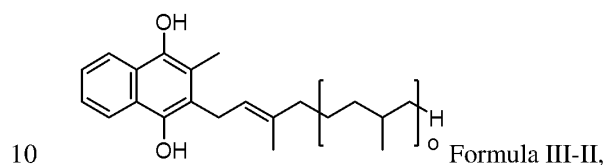
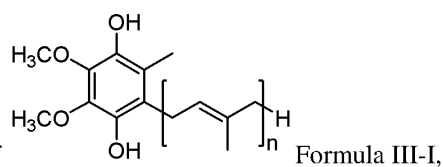
a combination thereof,

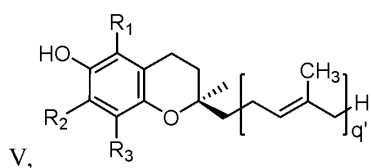
in the solvent having the formula of  Formula V,

with Compound B having the formula of

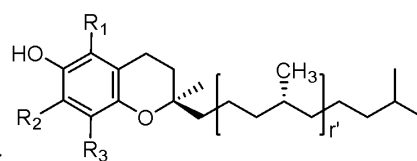


to form Compound C having the formula of





Formula VI-I, or



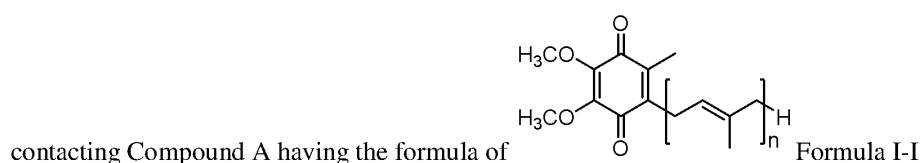
Formula

VI-II, or a combination thereof,

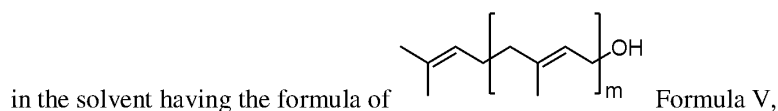
wherein r' and q' are each, independently, 1-20 and the rest variables are as defined in claim 1 the variables are as defined in claims 1-2.

5

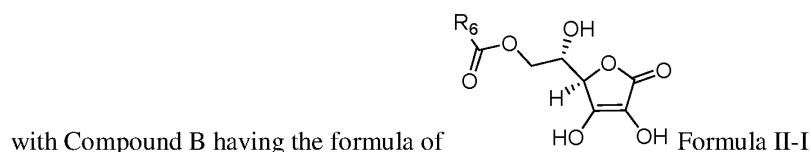
8. The method of claim 1, wherein the method comprises:



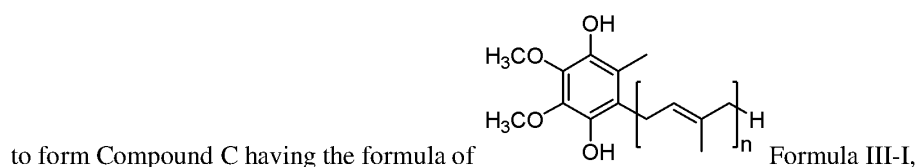
contacting Compound A having the formula of



in the solvent having the formula of



with Compound B having the formula of

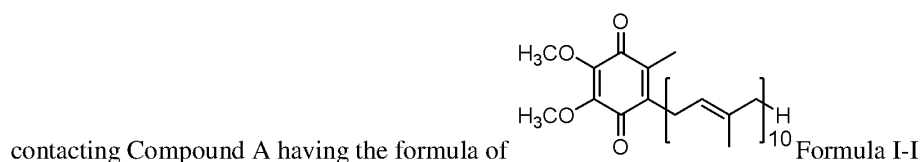


to form Compound C having the formula of

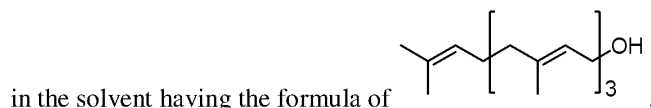
wherein m is 0-10 and the rest variables are as defined in claims 1-2.

10

9. The method of claim 6, wherein the method comprises:

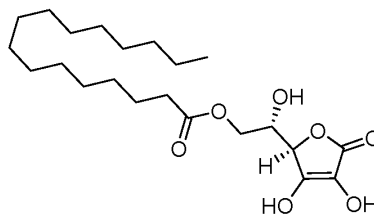


contacting Compound A having the formula of

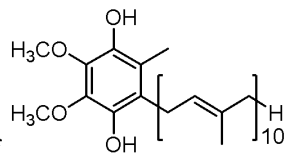


in the solvent having the formula of

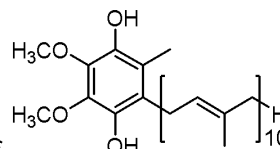
15



with Compound B having the formula of

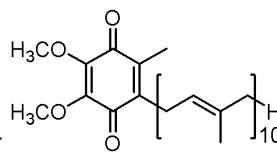


to form the compound having the formula of



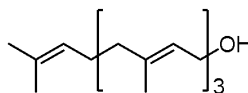
10. A method of preparing a compound having the formula of

5 comprising:

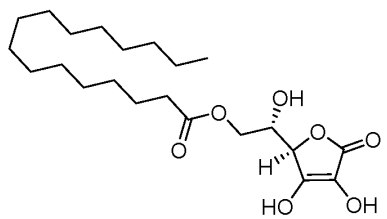


reducing Compound A having the formula of

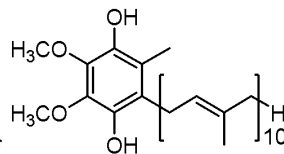
Formula I-I,



in the solvent having the formula of



with Compound B having the formula of

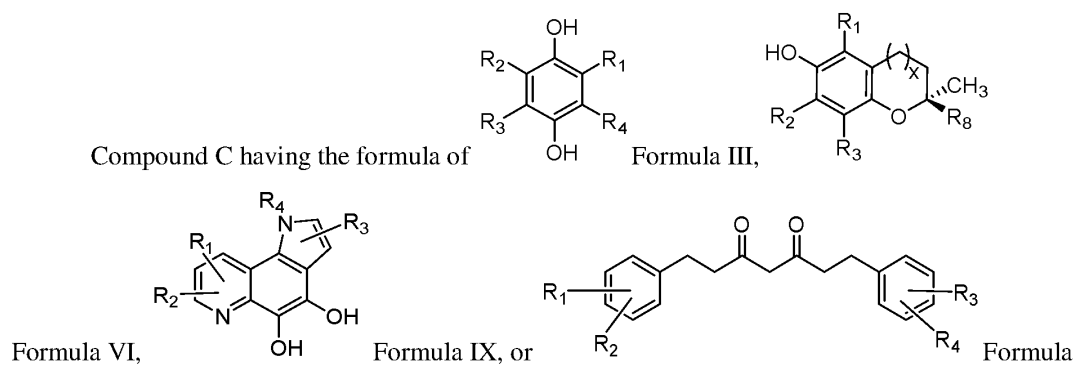


to form the compound having the formula of

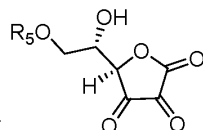
10 11. The method of any one of claims 1-10, wherein the method comprises:

a. heating the solvent in a mixing vessel to about 35-75 °C, preferably 45-65 °C;

- b. adding Compound A to the solvent of the step a to form a translucent solution;
 c. adding Compound B to the solution of step b to form a mixture and stirring the mixture until no visible second compound on the surface of the mixture;
 d. replacing the air in the vessel with an inert gas and sealing the vessel air tight; and
 5 e. stirring the mixture of step d for a period of time at an elevated temperature.
12. The method of claim 11, wherein the inert gas is Nitrogen or Argon.
13. The method of any one of claims 11-12, wherein the elevated temperature is in a range of
 10 about 30-100 °C, about 40-80 °C or about 50-70 °C.
14. The method of any one of claims 11-13 wherein the period of time is about 1 to about 13 days, about 2 to about 10 days, or about 3 to about 6 days.
15. The method of any one of claims 11-14, wherein the starting weight ratio of Compound A:Compound B:the solvent is in a range of about 4:0.5:4 to about 4:4:4.
16. The method of any one of claims 11-15, wherein the starting weight ratio of Compound A:Compound B:the solvent is about 4:2:4.
- 20 17. A composition comprising:



X;



Compound D having the formula of Formula IV; and

optionally a solvent wherein the optional solvent is non-toxic solvent and is free of or is not ethanol,

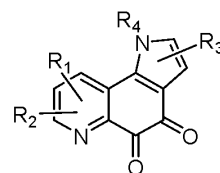
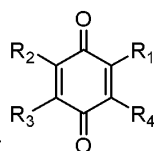
5 wherein:

R₅ is H, OH, NH₂, NO₂, R₆-C(=O)-, optionally substituted carbocycle, optionally substituted aryl group, optionally substituted heteroaryl group, branched or unbranched alkyl alcohol, halo, branched or unbranched alkyl, amide, cyano, alkoxy, haloalkyl, alkylsulfonyl, nitrite, or alkylsulfanyl;

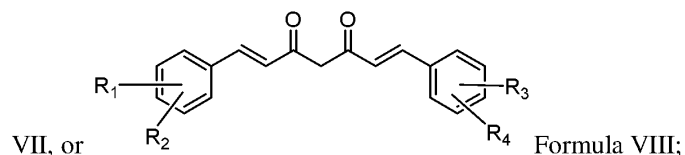
10 x is 0-6; and

R₁, R₂, R₃, R₄, R₆, and R₈ are each, independently, H, OH, NH₂, NO₂, optionally substituted carbocycle, optionally substituted aryl group, optionally substituted heteroaryl group, branched or unbranched alkyl alcohol, halo, branched or unbranched alkyl, branched or unbranched alkenyl, branched or unbranched carboxylic acid, branched or unbranched alkyl ester, branched or unbranched alkenyl ester, amide, cyano, alkoxy, haloalkyl, alkylsulfonyl, nitrite, or alkylsulfanyl; or R₂ and R₃ are together optionally substituted cycloalkyl, optionally substituted cycloheteroalkyl, optionally substituted aryl, or optionally substituted heteroaryl.

18. A composition comprising:

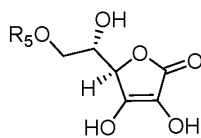


20 Compound A having the formula of Formula I, Formula

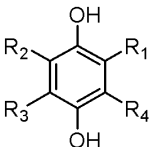
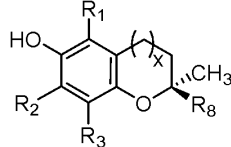


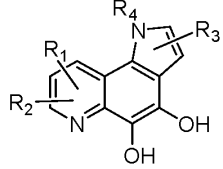
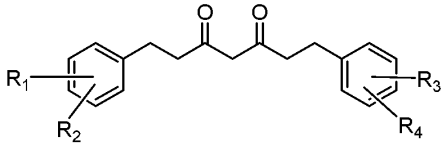
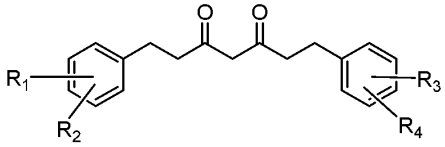
VII, or

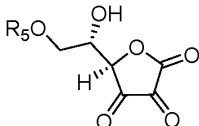
Formula VIII;



Compound B having the formula of Formula II;

Compound C having the formula of  Formula III,  Formula

 VI,  Formula IX, or  Formula X;

Compound D having the formula of  Formula IV; and

optionally a non-toxic solvent with the proviso that the non-toxic solvent is not ethanol.

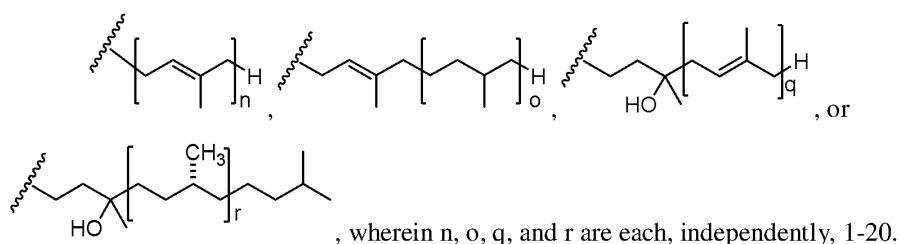
5 wherein:

R₅ is H, OH, NH₂, NO₂, R₆-C(=O)-, optionally substituted carbocycle, optionally substituted aryl group, optionally substituted heteroaryl group, branched or unbranched alkyl alcohol, halo, branched or unbranched alkyl, branched or unbranched alkenyl, branched or unbranched alkenyl ester, amide, cyano, alkoxy, haloalkyl, alkylsulfonyl, nitrite, or alkylsulfanyl;

10 x is 0-6; and

R₁, R₂, R₃, R₄, R₆, and R₈ are each, independently, H, OH, NH₂, NO₂, optionally substituted carbocycle, optionally substituted aryl group, optionally substituted heteroaryl group, branched or unbranched alkyl alcohol, halo, branched or unbranched alkyl, branched or unbranched alkenyl, branched or unbranched carboxylic acid, branched or unbranched alkyl ester, branched or unbranched alkenyl ester, amide, cyano, alkoxy, haloalkyl, alkylsulfonyl, nitrite, or alkylsulfanyl; or R₂ and R₃ are together optionally substituted cycloalkyl, optionally substituted cycloheteroalkyl, optionally substituted aryl, or optionally substituted heteroaryl.

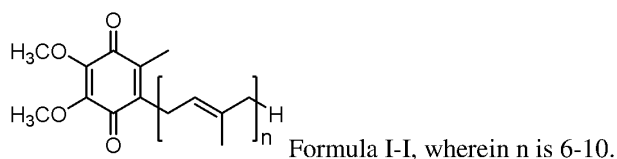
19. The composition of any one of claims 17-18, wherein R₄ has the formula of



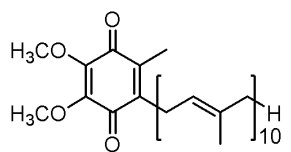
20. The composition of any one of claims 17-19, wherein R_1 , R_2 , and R_3 are each, independently, H, branched or unbranched alkyl alcohol, branched or unbranched alkyl, branched or unbranched alkenyl, or branched or unbranched alkoxy.

21. The composition of any one of claims 17-19, wherein R_1 , R_2 , and R_3 , are each, independently, branched or unbranched C_1 - C_6 alkyl alcohol, branched or unbranched C_1 - C_6 alkyl, branched or unbranched alkenyl, or branched or unbranched C_1 - C_6 alkoxy.

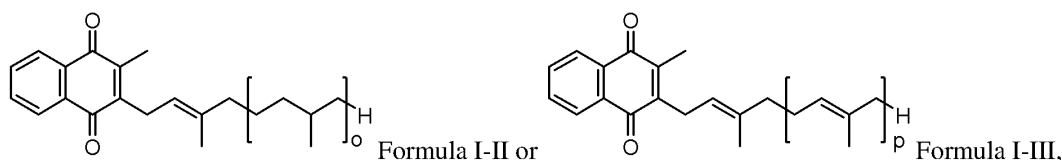
22. The composition of any one of claims 17-21, wherein Compound A has the formula of



23. The composition of claim 22, wherein Compound A has the formula of

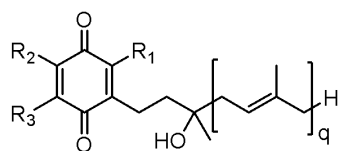


24. The composition of any one of claims 17-21, wherein Compound A has the formula of



wherein o and p are each, independently 3 or 6.

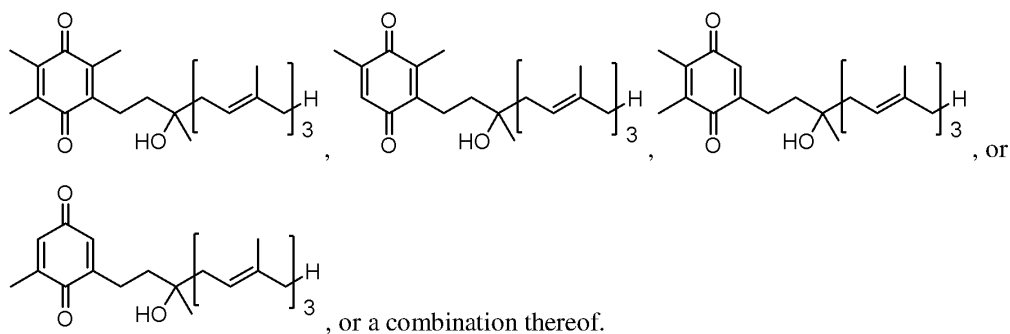
25. The composition of any one of claims 17-21, wherein Compound A has the formula of



Formula I-IV, wherein q is 3 and R₁, R₂, and R₃ are as defined

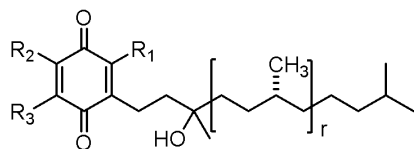
in claim 1.

26. The composition claim 25, wherein Compound A has the formula of



, or a combination thereof.

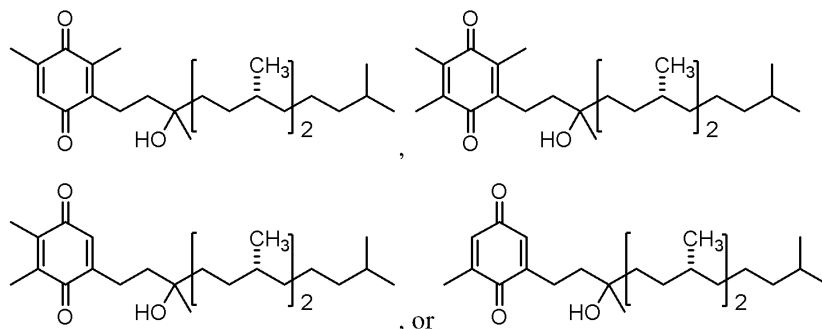
27. The composition of any one of claims 17-21, wherein Compound A has the formula of



Formula I-V, wherein r is 2 and R₁, R₂, and R₃ are as defined

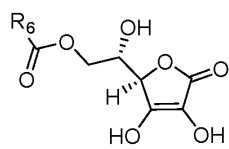
in claim 1.

28. The composition of claim 27, wherein Compound A has the formula of



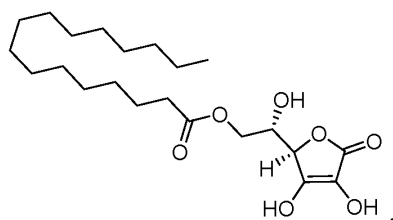
thereof.

29. The composition of any one of claims 17-28, wherein Compound B has the formula of

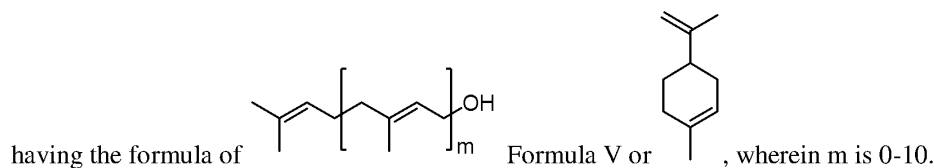


Formula II-I, wherein R_6 is branched or unbranched C_1 - C_{30} alkyl.

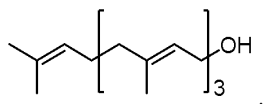
30. The composition of claim 29, wherein Compound B has the formula of



31. The composition of any one of claims 17-30, wherein the solvent is a non-toxic terpenoid



32. The composition of claim 31, wherein the non-toxic terpenoid has the formula of



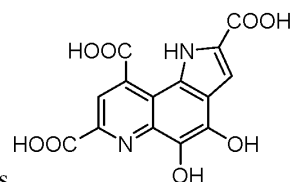
33. The composition of any one of claims 17-32, wherein the weight ratio of the total amount of Compound A and Compound C:Compound B is in a range of about 5:1 to about 1:5, about 3:1 to about 1:3, or about 2:1 to about 1:2.

34. The composition of any one of claims 17-33, wherein the weight ratio of Compound A:Compound C is in a range of about 99.9:0.1 to about 0.1:99.9, 40:60 to about 1:99, about 20:80 to about 1:99, about 15:85 to about 7:93, about 13:87 to about 7:93, about 13:87 to about 8:92, or about 13:87 to about 8:91.

35. The composition of any one of claims 17-34, the composition further comprises an antioxidant in an effective amount to reduce or prevent the oxidation of the compound for Formula III or Formula VI.

5 36. The composition of claim 35, wherein the antioxidant is α -tocopherol, β -tocopherol, γ -tocopherol, δ -tocopherol, α -tocotrienol, β -tocotrienol, γ -tocotrienol, δ -tocotrienol, or glutathione, or a combination thereof.

37. The composition of any one of claims 17-36, wherein the composition further comprises
10 vitamin B6.



38. The composition of claim 37, wherein the composition comprises

39. The composition of any one of claims 17-38, wherein the composition is formulated in a form
15 suitable for oral consumption or oral administration and the form is selected from the group consisting of a softgel, a capsule, 2-piece liquid-filled capsule, a bar, confectionary, chocolate, a powder, an oral suspension, a tablet, a pill, a hard-shell, a truffle, a ganache, a truffle ganache, a gum, and a chewable form.

20 40. A method, the method comprising:

mitigating or treating statin-induced CoQ10 diseases in a subject comprising administering to the subject the composition of any one of claims 17-39 or a composition prepared according to the method of any one of claims 1-16.

25 improving cardiac functions, increasing energy, increasing bone mineralization, prevention of joint osteophyte growth prevention and reversion of gall and kidney stones, reversal of arterial calcification, preventing statin-induced myopathy, preventing blood-thinning med-induced dementia, increasing myogenesis, preventing sarcopenia, preventing cancer-induced cachexia, increasing zest and thrive, preventing fibromyalgia, decreasing fatigue, preventing energy deficits, or improving general metabolic synthesis of proteins, CoQ10, or Vitamin K2 in a subject comprising

administering to the subject the composition of any one of claims 17-39 or a composition prepared according to the method of any one of claims 1-16;

increasing bioavailability and bioaccessibility of a second composition in a subject comprising administering to the subject the composition of any one of claims 17-39 or a composition prepared according to the method of any one of claims 1-16 with the second composition;

increasing absorption into an endothelial or internal surface skin of a dermatological composition, comprising administering to a subject the composition of any one of claims 17-39 or a composition prepared according to the method of any one of claims 1-16 with the dermatological composition;

improving mitochondrial function or increasing mitochondrial reproduction in a subject comprising administering to a subject the composition of any one of claims 17-39 or a composition prepared according to the method of any one of claims 1-16 with the dermatological composition;

improving neurological regeneration in a subject comprising administering to the subject the composition of any one of claims 17-39 or a composition prepared according to the method of any

one of claims 1-16; or

mitigating or treating nonalcoholic fatty liver in a subject comprising administering to a subject the composition of any one of claims 17-39 or a composition prepared according to the method of any one of claims 1-16;

wherein the subject of any of the foregoing can optionally be a subject in need thereof.