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Accepted Article

Title: Unravelling the relaxed specificity of laminaribiose phosphorylase from *Paenibacillus* sp. strain YM-1 towards mannose 1-phosphate

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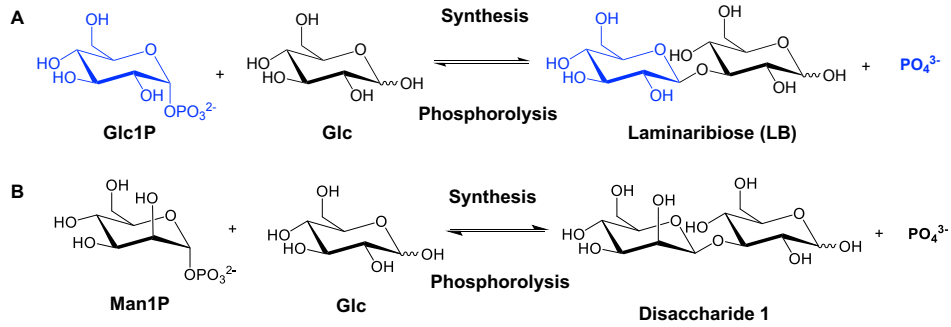
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/*\$</ * " :3' JH-I@?I INKL' "<'A:<k' %":). ".'+\$%\$.0^Nb0^R2' " :*\$) =* 'A: ' I "%'
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6(1*23IO) 4+ *#3' 13' 3%) 47' &*A1 *' I "%')<3' 3A:*3' H-INK' \$.' j0B0
="." I:\$<3'NO/*\$</ *":3'JH-"NKL' "<'A:<=>I\$<>'+\$%\$. 'M\$. '=>I\$-A/ A+
<>:%' *3<A<0' "-53A: '&A:* ' Nd' :A , 3-':3<<' 3MMAIA3%I>\$%' H-"NK8^A2' Y\$:*
6YK' "%+ ' 6BK' M.\$, ' 6(1*23IO) 4+28#3 41 '#((4' " .3' I' / "5-3' \$M'
)<A%=' #0B0=-)I\$<>' M'\$.A+3' "<' "' +\$%\$. ' M\$. ' :*3' <>:%' *3<A<' \$M'
I3-\$5A\$<3' "%+ ' 13-\$+3V: :A%8^I2' 6 *YK0' &*A1 *' %\$. , "->')<3<'
H-I@?I INK' "<'A:<' I\$%=" :3'+\$%\$.8''

@) , 3.\$)<' [0.'>' I.>:<-' <.:)I:).3<' " .3' " ; "A-"5-3' M\$. ' HSQR'
3%U> , 3<0'3A:*3' A%':*3' / .3<3%I3'\$M' / *\$</ *":3' \$.'<)- / *":3' JKBY'
I\$+3' \6 I !0'Z I B70'ZE I X0' \6 I PL0^I^b0^c2' . *3' " I13/ :\$.</ JKBY' I\$+3'
Z I RY0' Nmb [0' aSRD0' RnCH' "%+ ' a@ncL0^I^Q^Z^12' A , A%\$<)= " . 'A% *A5:\$.<
JKBY' I\$+3' Z I FX0' Z I Fn0' "%+ ' Z I Hd0' aSRNLO^I^Z^NZZ' \$.' +A<' I I * " .A+3'
/.\$+) I:<' JKBY' I\$+3' Z I R?0' RnCFLO^I^Z^12' P*3<3' <.:) I:).3<' / \$;A+3'
' ; "-) "5-3' .3<\$.) .I3<: * " : I "%' 53')<3+:' \$)=A+3' : *3' 3%<A%33. A%=' \$M'
HK<' M\$. '%\$%0I\$%=" :3' <)5<.: "3<8' !.:) I:).30=)A+3+<A:30+A.3I:3+
,)="3%3<A<' 5 "<3+> * "<' 533% / 3. M\$. , 3+ ' 3V:3%<A; 3->' \$%'
I3-\$5A\$<3' / *\$</ *\$.> "<3' M.\$, ' 6#(9&3%1' :%/(9) * ; 6:6YKLO'
A%I-) +A%='A:<k' I\$%; 3.<A\$%:'\$' " " : I:\$<3' / *\$</ *\$.> "<38^Z2^R2' M' "%+ A:\$%0'
" "<A%=-3' ,):"A\$%' J7]RQ6L' A% 6:6YK' I.3":3+ " %' 3%U> , 3' ; " A "%:'
' * " :A<' I' / "5-3' \$M')<A%=' , 3: * ">' !0=-) I\$<+30'3' * ">' !0=-) I\$<+3' "%+
/ *3%>' !0=-) I\$<+3' "<' " I13/ :\$.<8^Za0Z2' ?%\$:*3' 6:6YK' ; " A "%:'
&"<1.3":3+>5>' ,):"A\$%' \$M' "A; 3" , A%\$M' I A+&A:*A%'"%+>' . \$) %> : *3'
3%: " %' 13' :\$' : *3' 3%U> , 3' " I A; 30' &*A1 *' 5.\$' +3% " I13/ :\$. ' . "%=3' :\$'
A%I)+3' 5\$:* ' !0' "%+ #0=-) I\$<+3<8^Za2' M' I\$%: " <:' \$' : *3' <A:):"A\$%' \$M'
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A% I \$, /-3V' &A:*' : *3' <)" = .'+\$%\$.<' " .3' .3-":A; 3->' -A , A:3+0' &A:*' \$%>
" ' g0N0\0=-) I "%' / *\$</ *\$.> "<3' M.\$, ' <" 8\$1' 1(1*23IO) 4+
=8>21/#34#2' \$* ; <=; ! f HKL' A% I \$, /-3V' &A:*' H-INK' 53A%='
.3/ \$: .3+ ' JKBY' I\$+3' aSR\LO^I^Z^N2' &*A1 *' -A , A:<' \$) .') %>+3. <: "%+A%=' \$M'
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M' , A->8'

4 *A:<' I.>:<-' -\$. = / *A1' <:) +A3' / \$;A+3' ; "-) "5-3' k% " / <*\$<0' \$M'
3%U> , 3' " I A; 3' <A:3<0' : *3' >' +\$%' \$' I' /:).3' : *3' +>% " , A1<' \$M' : *3'

3%U> , 30+=" %+' A%:3. " I:A\$%' A%<-\$) :A\$%8' P*3.3M\$.30\$:*3' :3I *%A_)3<'
' :\$' <:) +>' / .:\$3A%0-A=" %+' A%:3. " I:A\$%' <' A%<-\$) :A\$%' " .3' %33+3+ '\$'
I \$, /-3, 3%: ' : *3' I.>:<-' -\$. = / *A1' + " : "0' ! " :).":A\$%' : " %<M3.'
+MM3.3%I3%) I-3' . ' , "=%3:A1' .3<3% " %' I3' </3I:\$.<I\$ /> ! PB' @9EL'
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/ .:\$%<:' \$' : *3' / .:\$%<' \$M' : *3' -=" %+' &*A-<:' : *3' -=" %+' A<' 5\$) %>8^Zb2'
P*\$<3' -=" %+' / .:\$%<' A% I-\$<3' I\$%: " I' &A:*' : *3' / .:\$3A% 3V *A5A: : *3'
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A%<-\$) :A\$%' +) 3' :\$' : *3' &3' # ' MMAA:> "<' &3- ' "<' : *3' M-3V15A+> " %+'
I \$, /-3VA:> \$M' : *3' I' .5\$ * >+ . " :3' -=" %+' <8' ! PB' @9E' * "<' 533%)<3+>
' :\$' 3-) I A: " :3' : *3' </3IAMAIA:> \$M' / .:\$3A%0=> I "%' A%:3. " I:A\$%' <' \$%'
+MM3.3%<A' -\$=> I "%<.:) I:).3<0^Z02' M' "%+ ' \$: 3; 3-': *3' A , /\$: " %' 13' \$M'
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5A\$-\$=I "-' " I A; " :A\$%' \$M' A:<' .3I3/ :\$.8^Rd2' P* A<' :3I *%A_)3' * "<' -<\$'
533%)<3+> '\$' <:) +>' 3%U> , 30I' .5\$ * >+ . " :3' A%:3. " I:A\$%' <' \$'
3-) I A: " :3' .3I\$%='A:\$%' M3' :).3<: * " : I "%' 53')<3+ ' M\$. ' A% *A5A: \$.' +3<A%<0'
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A% ; \$; 3+ ' A% , >I \$5' I:3. A' -' I3- ' & " -' 5A\$<> : *3<A<0' A%I-) +A%=' TBK0
=" " I: \$ /> . "%\$<3' ,) :<3' ^IRNR^12' "%+ '
=" " I: \$M' . "%\$<: : " %<M3. " <3<8^RZ2' P*3' < " , 3' :3I *%A_)3' * "<' 533%'
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F\$-\$&A%=' \$% M.\$, \$) . '3MM\$.<:' \$) %>+3. <: "%+ ' HK' <.:) I:).30M' % I:A\$%'
' .3-':A\$%' <' A' <' "%+ ' : *3A' " //A1 " :A\$%' A% I' .5\$ * >+ . " :3' <>:%' *3<3<'
' ^ZdR]0Rb2' *3.3A% &3' A%; 3<A=" :3+> : *3' HSQR' - , A% " .A5A\$<3'
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' / .3; A\$) <> ' 533% .3/ \$: .3+ ' M\$. ' A:<' </3IAMAIA:> :\$& .'+<' - , A% " .A5A\$<3'
' J!0B0=-) I\$ /> . "%\$<>0JN " ZLOB0=-) I\$ /> . "%\$<3L' J! I *3 , 3' N?L8^NZZ'
' 43' * " ; 3; 3-) :3+> : *3' I A; A:> \$M' ! *CYK' \$' " "%\$%0I\$%=" :3'+\$%\$.0'
' j0B0 , "%%\$<3' NO/*\$</ *":3' J9 " NKLO' "%+ ' I\$%=" :3' " I13/ :\$.0'
' =) I\$<30' A% : *3' /.\$+) I:A\$%' \$M' !0B0 , "%%\$ /> . "%\$<>0(N " ZLOB0
' =) I\$ /> . "%\$<3' J+<' I I * " .A+3' 9LO' J! I *3 , 3' NYL8' F) : *3. , \$.30' &3'
)<3+> [0.'>' I.>:<-' -\$. = / * >' A% I\$%e) % I:A\$%' &A:*' ! PB' @9E' :\$'
A% ; 3<A=" :3' : *3' A%:3. " I:A\$%' 53: &33% ! *CYK' "%+ ' A:<' <:) 5<.: " :3<0' A%'
\$.M+3' :\$) %>+3. <: "%+<.:) I:).3<-' M3' :).3<: * " : I \$%: .A5) :3' \$' A:<+>\$%\$.
<) 5<.: " :3' </3IAMAIA:> 8''



?, & 3 & 9% C& \$ / (2 - * / \$ ## (& ; 2 < + 41' * H I J 5' FDK * H - INK' "% + H - I' " < " + \$ % \$. " "% + " I 13 / : \$. ' . 3 < / 31 : ; 3 - > 8' F I K' 9 "% NK' "% + H - I' " < " + \$ % \$. " "% + " I 13 / : \$. ' . 3 < / 31 : ; 3

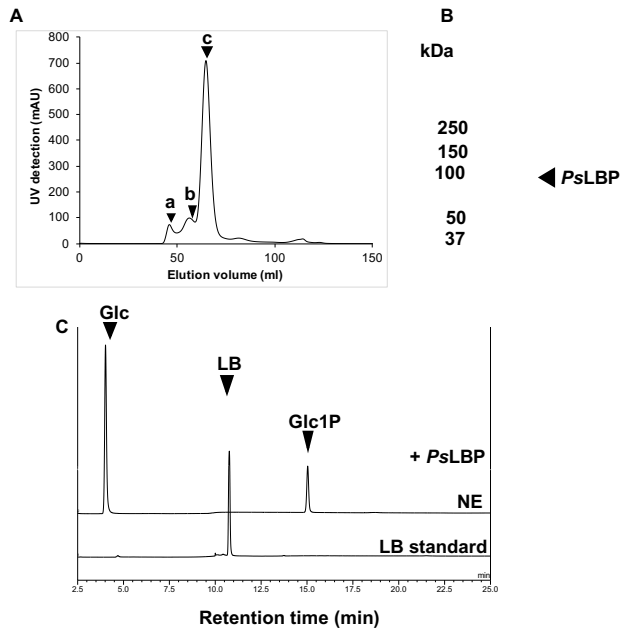
C & - < ' + - *

C & / 2 3 4 (" \$ " * . # 2 + & (" * & L . # & - - (2 " * \$ " ; * ! * H I J * \$ / + (+ 1 * 2 " * + , & * \$ + (% & * ; 2 " 2 # \$ " ; * \$ / / & . + 2 # 8' !

PS' \$ 5 : " A % ' . 31 \$, 5 A % " % : ' ! * CYK' / . \$: 3 A % " " \$. " % \$ 9 / 2 3 1' I * " . " I : 3 . A < " : A \$ % ' " % + [0 . " > ' I . > < : " - \$ = . " / * > 0' : * 3 = 3 % 3' 3 % I \$ + A % = ' < 3 _) 3 % I 3' \$ M' ! * CYK' & " < ' \$ 5 : " A % 3 + ' M . \$, ' H 3 % Y " % # ' J " I 1 3 < < A \$ % ') , 5 3 . ' ? Y a] c \ Q c 8 \ L 0' I \$ + \$ % 0 \$ / : A , A < 3 + ' M \$. ' ? 2 + ' 1 (' 3 V / . 3 < < A \$ % ' " % + < > % : * 3 < < 3 + ' 5 > ' H 3 % Q 8' P * 3' = 3 % 3' & " < ' , / - A M 3 + ' 5 > ' K 6 E' " % + ' I - \$ % 3 + ' A % : \$ ' " " K \$ / A % F' 3 V / . 3 < < A \$ % ' ; 31 : \$. 8' R c 2' P * 3' . 31 \$, 5 A % " % : ' / - < , A + ' I \$ % : " A % A % = ' : * 3' ! * < . ! ' = 3 % 3' & " < ' A % : . \$ +) I 3 + ' A % : \$ ' Y C \ N' J B 7 Z L' M \$. ' / . \$: 3 A % ' 3 V / . 3 < < A \$ % 0' S A < 0 : " = 3 + ' . 31 \$, 5 A % " % : ' / . \$: 3 A % ' & " < ' : * 3 % / . \$ +) I 3 + ' " % + /) . A M 3 + ' 5 > ' A , , \$ 5 A + A < 3 + ' " M M A % & : > ' I * \$, " : \$ = . " / * > 0' M \$ - \$ & 3 + ' 5 > ' = 3 - M A : . " : A \$ % 8' P * 3' = 3 - M A : . " : A \$ % : . " I 3 < * \$ & 3 + ' Z' + A M M 3 . 3 % : ' , " A % / 3 " # < ' & A : * + A M M 3 . 3 % : ' 3 -) : A \$ % : A , 3 < J F A =) . 3' N ? 0' / 3 " # < " 0' 5 " % + ' I L 8' " M % ' \$. + 3 . ' : \$ A % ; 3 < A = " : 3' & * 3 : * 3' : * 3' Z' , " A % / 3 " # < * " ; 3' < A , A - . " I : A ; A : A 3 < 0' : * 3' / * \$ < / * \$. > - < 3' " I : A ; A > ' \$ M' 3' I * ' / 3 " # ' & " < ' A % + ; A +) - > ' I * " . " I : 3 . A < 3 + ' A % ' : * 3' < > % : * 3 : A I' + A . 31 : A \$ % ' J ! I * 3 , 3' N ? L' 5 > ' / * \$ < / * : 3' . 3 - 3 < 3' " < < > < 8' @ \$' < A = % A M A I " % : ' + A M M 3 . 3 % I 3' A % " " I : A ; A > ' & " < ' \$ 5 < 3 . ; 3 + ' 5 3 : & 3 3 % : * 3 < 3' Z' / 3 " # < ' J + " : " % \$: ' < * \$ & % L' " % + : * " : ' : * 3' 3 % U > , 3' A % / 3 " # ' " " % + ' 5 " . 3' - # 3 - > : * 3' * A = * 3 . ' \$ - = \$, 3 . A I' M \$. , < ' \$ M' ! * CYK 8' P * 3 . 31 \$. 30' \$ % - > ' / 3 " # ' I' & " < ') < 3 + ' M \$. ' M) : . * 3 . ' 3 V / 3 . A , 3 % : < ' 5 " < 3 + ' \$ % ' A : < ' * A = * 3 < : ' / . \$: 3 A % ' > A 3 + 8' ! B ! 0 K ? H 7' " % " - > < < ' \$ M' / 3 " # ' I' < * \$ & 3 + ' " , " e \$. ' 5 " % + ' \$ M' / . \$: 3 A % ' & A : * " % ' " / / . \$ V A , " : 3' < A U 3' \$ M' N d d' # B " 0' A % " = . 3 3 , 3 % : & A : * : * 3' I " - I) - . : 3 + ' , " < < ' \$ M' ! * CYK' , \$ % \$, 3 . ' J N d N 8' # B " L' J F A =) . 3' N Y L 8' S \$ & 3 ; 3 . 0' = 3 - ' M A : . " : A \$ % " % " - > < < A \$ M' / 3 " # ' I " = " A % < : < " % + " . + / . \$: 3 A % < * \$ & 3 + : * " : ' ! * CYK' M \$. , 3 + ' " " + A , 3 . ' A % ' % \$ % 0 + 3 % " :) . A % = ' I \$ % + A : A \$ % < ' & A : * " % ' 3 < : A , " : 3 + ' , \$ - 31) - . ' , " < < ' \$ M' \ R d # B " 8' "

PS' \$ M) : . * 3 . ' I \$ % M A . , ' : * " : : * 3' . 31 \$, 5 A % " % : ' ! * CYK' & " < ' " I : A ; 30' : * 3' 3 % U > , 3' & " < " < < > 3 + ' A % : ' : * 3' < > % : * 3 : A I' + A . 31 : A \$ % ' J ! I * 3 , 3' N ? L' A % : * 3' / . 3 < 3 % I 3' \$ M' A : < ' % :) . " - < <) 5 < : . " : 3 < ' J H - I' " % + H - INK L' " % + : * 3'

. 3 " I : A \$ % ' , A V :) . 3' & " < ' <) 5 : 31 : 3 + ' : \$' S K ? 7 6 0 K ? B' " % - > < < 8' P * 3' " % " - > < < < * \$ & 3 + : * " : - , A % " . A 5 A \$ < 3' J C Y L' & " < ' / . \$ +) I 3 + ' J F A =) . 3' N 6 L 0' I \$, / - 3 , 3 % : 3 + ' 5 > : * 3' . 3 - 3 " < 3' \$ M' A % \$ = " % A I' / * \$ < / * " : 30' & * A I * ' I \$) + ' 5 3' + 3 : 31 : 3 + ' 5 > " / * \$ < / * " : 3' . 3 - 3 " < 3' " < < > ' J F A =) . 3' ! N L 8' Z a 2' ,



M () < # & 9% N L . # & - - (2 " * \$ " ; / , \$ # / + & # - \$ + (2 " * 20 # & / 2 3 4 (" \$ " * ! * H I J 5' FDK = 3 - ' M A : . " : A \$ % " % " - > < < : \$ + 3 : 3 . , A % 3' : * 3' < A U 3' \$ M' K < CYK 8' 7 -) : A \$ % ; \$ -) , 3' \$ M' / 3 " # ' I U] R 8 b' , - L' & " < ') < 3 + : \$' 3 < : A , " : 3' : * 3' , " < < ' \$ M' : * 3' / . \$: 3 A % " M . \$, " " I - A 5 . " : A \$ % ' I) . ; 3' I \$ % < :) I : 3 + ' M . \$, < ' : " % + " . + / . \$: 3 A % < & A : * # % \$ & % , \$ - 31) - . ' , " < < 8' F I K' ! B ! 0 K ? H 7' " % " - > < < ' \$ M' : * 3' . 31 \$, 5 A % " % : ' / . \$: 3 A % " " M : 3 . " 9 ? 6' " % + = 3 - M A : . " : A \$ % 8' F O K' S K ? 7 6 0 K ? B' " % " - > < < ' \$ M' : * 3' < > % : * 3 : A I' . 3 " I : A \$ % ' I " . A 3 + \$) : 5 > ' K < CYK' & * 3 % A % I) 5' : 3 + : * 3' 3 % U > , 3' & A : * N d' , 9' H - I' " % + ' N d' , 9' H - INK' M \$. ' Z d' , A %) : 3 < " : ' R a' 8' @ 7' q' % \$ 3 % U > , 3' I \$ % : . \$ 8' "

D / + (+ 1 * 2 : \$ # ; - * 2 " 8 / 2) " \$ & * ; 2 " 2 # - 8' "

! * CYK' " I : A ; A > ' * " < ' / 3 ; A \$) < > ' 5 3 3 % < I . 3 3 % 3 + ' \$ % ' < 3 ; 3 . " - % \$ % 0 I \$ = " : 3' " I 1 3 / : \$. < 0' A % I -) + A % = ' , " % % \$ < 30' , 3 : * - > ' g 0 = -) I \$ < A + 30' \ 0 + 3 \$ V > = -) I \$ < 3' " % + '] 0 + 3 \$ V > = -) I \$ < 30' & A : * a d 0 N d d' M \$ - + . ' 3 +) I : A \$ % ' A % "

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JE06Y?KL8^{lab2} ! *CYK' - " I#<: *3' 3V:3%+3+' @0:3. , A% " - j sg' +\$, " A% JF(=) .3' ZY0' /) . / -3L: * " : A< \$%> / .3<3%: A% HSQR' \$<=\$< " I I * " . A+3' / *\$</ *\$> .<3< < A% (-) + A% = ' I3--\$+3V: A% / *\$</ *\$> .<3' W. \$, ' F) 4!\$1'(1 *230%) 4+28#341 '#() 4+JF26BKL' ^{IZd2} " % + ' <= ! f HK8^{ZN2} P*3' . \$-3' \$M' : *3' 3V:3%+3+' @0:3. , A% " - j +\$, " A% A% F26BK' & " < / . \$ / \$<3+' : \$'53' A% ; \$- ; 3+ A% : *3' A% :3. " I : A\$% \$M' : *3' -\$&3' / \$. : A\$% < \$M' : *3' *\$, \$+ A , 3.0' I ") < A% = : *3' / / 3. / \$. : A\$% < : \$' , \$; 3' " / . : 0' & *A I * ' -3' +< : \$' " ' & A+3% A% = \$M' : *3' " I : A ; 3' < A : 3' : \$' " I I \$, , \$ + : 3' " - = 3. ' " I I 3 / : \$. ' JH838' I3--\$+3V: A% L A% ' F26BK8^{IZd2}

J, 2- . , \$&#&2) "(2**41* !HIJ*

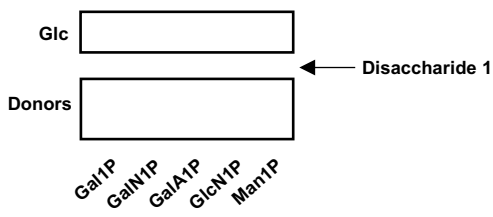
W% : *3' ! f R⁰ I \$, / -3V' JF(=) .3' ! Q?L0' ! f R⁰ & *A I * & " < +3.A ; 3+ W. \$, ' : *3' / .3I A / A : " % : ') < 3+ W. \$. ' I . > : " - A U " : A\$%0' \$ I I) / A3+ " " < A , A - ' / \$< A \$% : \$' / *\$</ *\$> : *3' " % + ' <) / * : 3' A% \$: *3' HSQR' + A < " I I * " . A+3' / *\$</ *\$> .<3< <) I * " < A% ' 6 : 6YK' JF(=) .3' ! QYL8' " ' P*3' ! f R⁰ , \$-3I) -3' W. \$. , < ' * > + . \$ = 3% 5\$% + < & A : * ' EZaZ0' PbZN' " % + ' 7bc \ < A+3' I * " A% < 8' F. \$, ' : *3' " , A% \$ ' I A+ ' < 3_) 3% I3' " - A% = , 3% : ' \$M' ! *CYK0' 6 : 6YK' " % + ' F26BK0' SbZQ' A% ! *CYK' " - A% 3+ & A : * : *3' I \$% < 3 ; 3+ * A : A+ A% 3' .3< A+) 3< A% ' 6 : 6YK' " % + ' F26BK' : * " : W. \$. , < ' " * > + . \$ = 3% 5\$% + & A : * / *\$</ *\$> : *3' " I : A ; 3' < A : 3' JF(=) .3' ! QYL8' S\$&3 ; 3.0' : *3' + A < : " % I3' 53 : & 33% ' SbZQ' < A+3' I * " A% " % + ' ! f R⁰ A% ! *CYK' < .) I :) .3' A < ' = 3 : 3 . : * " % ' * > + . \$ = 3% 5\$% + A% = + A < : " % I30' <) == 3 < : A% = : * " : ' SbZQ' , " > ' % \$: ' 53' 3 < < 3% : A " - ' W. \$. / *\$</ *\$> : *3' .3I \$ = % A : A\$% 8' P* A < A < ' W.) : *3' <) / / \$: 3+ ' 5> : * .33' 3 ; A+3% I3< 8' ' F. A : < : > 0' & *3% : *3' I \$. 3< / \$% + A% = * A < A+ A% 3' JS]]] L' A% ' 6 : 6YK' & " < ' ,) : 3+ : \$' ? < % 0' " " / *\$</ *\$> : *3' , \$-3I) -3' < A - ' 5\$) % + : \$' : *3' " I : A ; 3' < A : 3' \$M' : *3' 3% U > , 3' JKBY' I \$ + 3' Z ? 6PL8' ! 3I \$% + > 0' : *3' / *\$</ *\$> : *3' , \$I3 : > A% ' H-INK' A% I \$, / -3V' & A : * <= ! f HK' + \$3< ' % \$: ' W. \$. , ' * > + . \$ = 3% 5\$% + & A : * : *3' I \$. 3< / \$% + A% =

* A < : A+ A% 3' JSQ \ RL' JF(=) .3' RYL8^{ZN2} C " < : > 0' " " & A+0 : > / 3' I3-\$+3V: A% / *\$</ *\$> .<3' W. \$, ' F) 4!\$1'(1 *230%) * : " (&) * * " < H-%] R] A% < 3' + \$M' : *3' I \$% < 3 ; 3+ ' S A < .3< A+) 3' : * " : A < ' W. \$) % + ' A% \$: *3' HSQR' / *\$</ *\$> .<3< 8^{lab2}

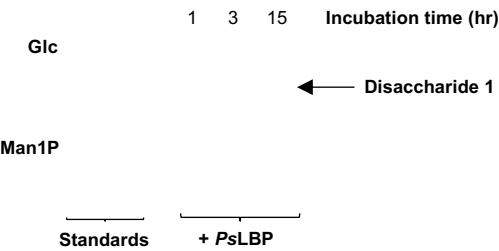
Q'/9J*\$" ; *7\$9J#&2) "(2**41* !HIJ*

P*3' \$; 3. " - ' < .) I :) .3' \$M' ! f R⁰ I \$, / -3V' " % + ' H-INK' I \$, / -3V' " .3' ; 3. > ' < A , A - . ' JE898!8B' \$M' d8 \ Z' t' W. \$. ' " + A , 3. ' \$% ' + A , 3. ' <) / 3. / \$< A : A\$% 8' H-INK' & " < ' 5\$) % + ' & A : * : *3' / > . " % \$ < 3' . A% = A% ' R6N' I \$% W. \$. , " : A\$% " % + ' j0' % \$, 3.A I ' I \$% A% =) . : A\$% \$M' / *\$</ *\$> : *3' : 6N' / \$< A : A\$% 0' <) / / \$. : A% = : *3' 3% U > , 3' < / 3I A A I A : > W. \$. <) = " . NO / *\$</ *\$> : *3' A% #0' % \$, 3.A I ' I \$% A% =) . : A\$% 8' H-INK' A < I \$, / -3 : 3 > ' 5) . A3+ & A : * A% " " + \$% \$. <) 5 < A : 3' JON <) 5 < A : 3L0' & *A I * ' A < W. \$. , 3+ ' 3% : A . 3 > ' & A : * A% " " < A% = 3' <) 5) % A : \$M' ! *CYK8' 6\$, / " . A < \$% 53 : & 33% ' H-INK' I \$, / -3V' \$M' ! *CYK' & A : * : *3' : \$M' <= ! f HK' JF(=) .3' RY0' KBY' I \$ + 3' aSR \ L' < *\$&3+ : * " : ' H-INK' .3I \$ = % A : A\$% 5> : *3' : & \$' / . \$: 3A% < A < + A M3 . 3% 8' W. \$! *CYK0' : *3' * > + . \$ V > - = . \$) / \$% ' 6Z' W. \$. , " " * > + . \$ = 3% 5\$% + & A : * ' EZbR' < A+3' I * " A% JF(=) .3' R?L0' & *3.3' < A% <= ! f HK0' : *3' < , 3' * > + . \$ V > - = . \$) / W. \$. , < * > + . \$ = 3% 5\$% + < & A : * ' E JZd' " % + ' B] ZN8' W. \$ <= ! f HK' < .) I :) .30' B] ZN' " < \$' A% ; \$- ; 3< ' A% : *3' .3I \$ = % A : A\$% \$M' : *3' * > + . \$ V > - = . \$) / \$% ' 6 \ ; A " * > + . \$ = 3% 5\$% + A% = 0' & *3.3' < A% ! *CYK0' : *3' * > + . \$ V > - = . \$) / W. \$. , < * > + . \$ = 3% 5\$% + & A : * ' EZaZ8' P*3' 3_) A ; " -3% I3' \$M' B] ZN' A% ! *CYK' JBZbal' W. \$. , ' * > + . \$ = 3% 5\$% + & A : * : *3A : *3' : *3' * > + . \$ V > - = . \$) / < \$% ' 6 \ \$. ' 6Z' 53I ") < 3' : *3' + A < : " % I3' 53 : & 33% : *3' * > + . \$ V > - = . \$) / < \$% ' 6 \ " % + ' 6Z' " % + ' BZba' A < ' = 3 : 3 . : * " % : *3' * > + . \$ = 3% 5\$% + A% = + A < : " % I38' P*3' / *\$</ *\$> : *3' , \$A3 : > A% ' H-INK' " < \$' A% : 3. " I : A + M3 . 3% : > ' & A : * : *3' 3% U > , 3' " I : A ; 3' < A : 3< 8' W. \$! *CYK0' : *3' / *\$</ *\$> : *3' , \$I3 : >

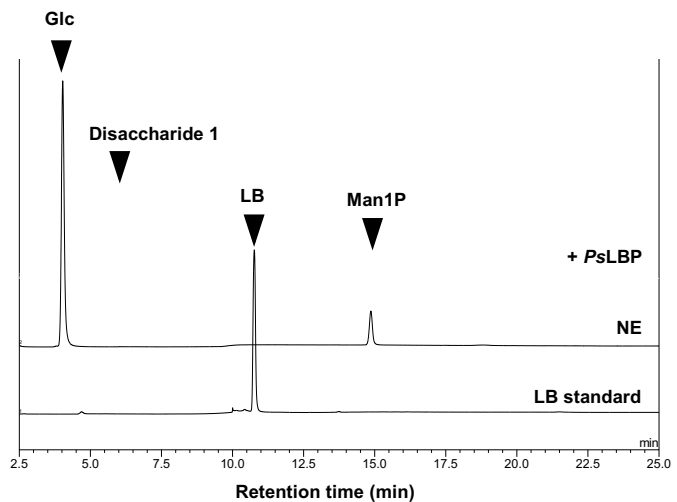
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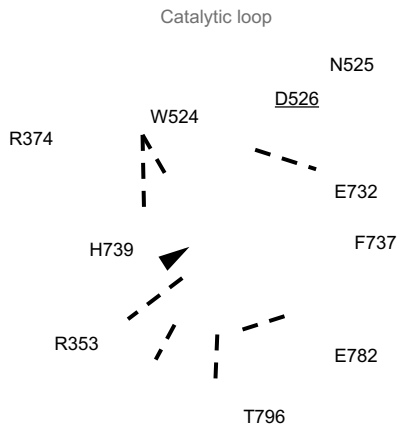
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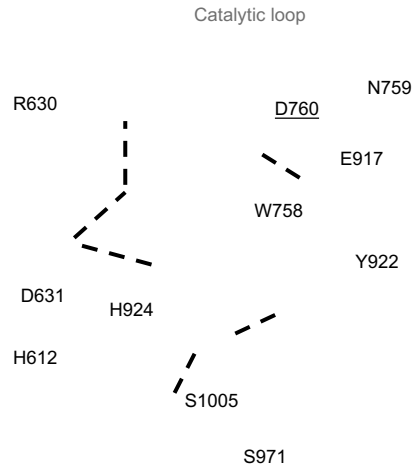
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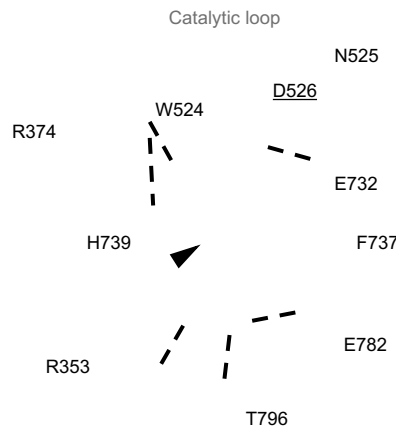
A



B



C



M()<#&'U5°O23 . \$#(-2**4&+ : &&'2! -H I J'FDK'\$" ; *34?PQJ'FIK'("*/23 . 'L* : (+, 'Q'/9J5'FOK@ , &*\$/(%&+(-&'202! *H I J'("*/23 . 'L* : (+, '7\$ "9J5'P*3'6 \ / \$<: :\$% '\$% : *3' /> . "%\$<3' . :%=>'<'&+&I " : 3+&A : *5- " I# " . . \$&' *3" +8' P*3* / . :\$3%5' I#5\$3'<'< *\$&% 'A% ' I " : :\$% ' . 3/ . 3<3% : " :\$% ' " % + : *3' %3! = *5\$) . A% = <+3' I * " A%<' A%< : :A1# . 3/ . 3<3% : " :\$%8' P*3' I \$%<3 . ; 3+&I " : :> :A1'-\$\$/ 'k' / . 3<3% : 3+&A% /) . / -38' P*3' I " : :> :A1' . 3<+&3' JBa \] L'k') % +3 . -A%3+8'

O\$+\$'1+/**22 . *("QVWU*&'X13&-*

P*3' I " : :> :A1'-\$\$/ 'J') . / -30' Fh=) . 3' RL'k' " " " *h = *->' I \$%<3 . ; 3+&I3' :) . 3' " , \$% = ' HSQR' < : .) I :) . 3<8' W% ' ! *CYK0' : *h<'-\$\$/ ' I \$%<k< :<' \$M' 4 @B' , \$: M' J 4 a \ R0' @a \ a' " % + Ba \] L0' &A : *Ba \] " < " " / . 3+&I : 3+&I " : :> :A1' . 3<+&) 38' P*3' : .> / \$ / * " % . 3<+&) 3' J 4 a \ RL' h< :< : .) I :) . " ->' I \$%<3 . ; 3+& " , \$% = ' HSQR' , 3 , 53 .<' " % + / . \$; A+3<' " " + . \$ / *5A I' / - : :I \$. , 'I \$. : *3'5A% +A% = \$M' : *3' + \$% \$. 8^Zd2'' 6\$, / " . A<\$% '53 : &33% : *3'6 : 6YK' " % + ! *CYK' < : .) I :) . 3<'< *\$&3+ : * " : : *3' ! *CYK' " I : A ; 3' < : A' k' < : A = * :>' , \$. 3' I-\$<3+&' A% ' I \$, / " . A<\$% ' : \$' 6 : 6YK' +) 3' : \$' <3 ; 3 . " - + M M 3 . 3% : < : .) I :) . " -I3' :) . 3<8' Fa .< :>0' : *3' -3% = : *\$M' : *3' ! *CYK' I " : :> :A1'-\$\$/ ' h<' Nd0" , A%\$ " I + . 3<+&) 3<'< *\$: 3 . : * " % ' : * " : ' \$M' 6YK0' " % + \$%>' / " . A " ->' \$ I I -) +3<' : *3' " I : A ; 3' < : A' 38' W% ' I \$% : . < : 0' : *3' 3V : 3% +3+&'

I " : :> :A1'-\$\$/ 'A% ' 6 : 6YK' I \$. , <' " " A+0-h#3< : .) I :) . 3' : * " : 3V : 3% +<' \$; 3 . : *3' " I : A ; 3' < : A' 3' JFh=) . 3' ! Nd? " " % + 'Y0' /) . / -3L8' ! 3I \$% +>0' : *3' / \$< : A \$% ' \$M' : *3'k' +e' I 3% : -\$\$/ ' JFh=) . 3' ! Nd? " " % + 'Y0'5 . \$&L' .) % <' A% / " . " -3- : \$' " " <A = % M A I " % : / . \$ / \$. : A \$% ' \$M' I " : :> :A1'-\$\$/ ' A% ' 6YK0' I \$. , A% = ' " UA / / 3 . 0-h#3' A% : 3 . M' I 3' : * " : ' M) . : *3 . 3% I-\$<3< : *3' 6 : 6YK' " I : A ; 3' < : A' 38' P*3' "5<3% I3' \$M' : *3' 3V : 3% +3+&' I " : :> :A1'-\$\$/ ' A% ' ! *CYK' , " >' 53' I \$, / 3%< : 3+&I \$. : *3' / . 3<3% I3' \$M' " : \$\$/ ' A% : *3' g0< " % + &A1' * + \$, " A% ' \$M' : *3' / \$ / \$<A% = <) 5) % A : 0' & *A1' * h< < AV' . 3<+&) 3<'-\$% = 3 . : * " % : *3' 3_) A ; -3% : -\$\$/ ' A% ' 6 : 6YK5+ P* h<' I \$. , <' " " g0* " A . / A% ' k = " : 30'-\$\$/ '0' & *A1' * \$; 3 . " / < : &A : * " : *3' 3V : 3% +3+&' I " : :> :A1'-\$\$/ ' A% + 6 : 6YK' JFh=) . 3' ! NdY6' " % + 'B0' I > " % L8'

FULL PAPER

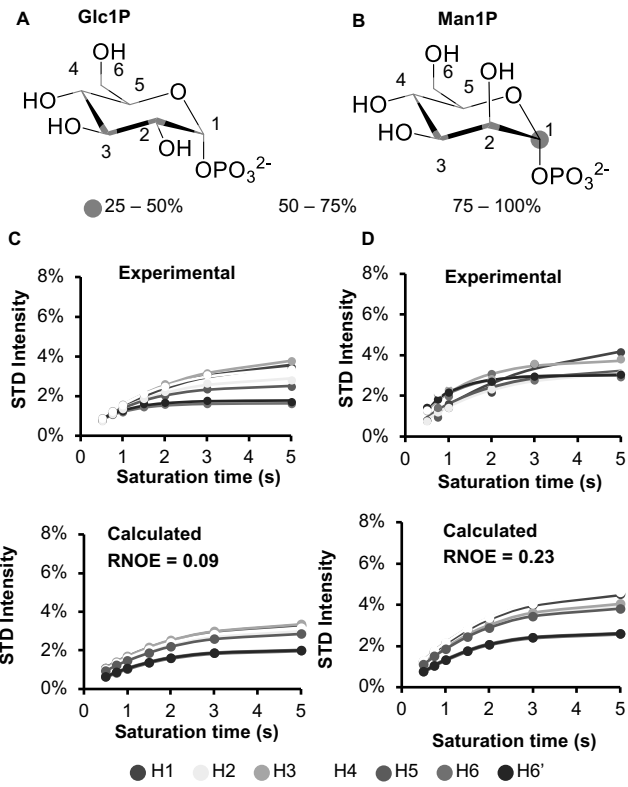
9 \$.3 \$; 3 .0 ' : * 3 ' \$ / / \$ < % = - \$ \$ / ' % ' 6 : 6 YK ' / . \$ e 3 I : < ' % \$: ' * 3 ' " I : A ; 3 ' < A : 3 ' , \$ 3 : * " % ' : * " : \$ M ' ! * CYK ' JF A =) . 3 ' ! N d 0 ' . 3 + L 8 ' 4 * 3 . 3 ' < ' % ' / * CYK 0 ' : * 3 ' " I : A ; 3 ' < A : 3 ' A < . 3 - : A ; 3 - > \$ / 3 % 0 < % 1 3 ' : * 3 ' \$ / / \$ < % = " % + " + e " 1 3 % : - \$ \$ / < ' . 3 ' : \$ I ' : 3 + M) . : * 3 . ' & " > " M . \$, ' : * 3 ' " I : A ; 3 ' < A : 3 ' & A : * . 3 < / 3 I : ' : \$ ' : * \$ < 3 ' % ' : * 3 ' 6 : 6 YK ' < : .) I : . 3 8 ' P * 3 ' . 3 - : A ; 3 - > ' y \$ / 3 % z ' < : ' : 3 ' \$ M ' : * 3 ' ! * CYK ' " I : A ; 3 ' < A : 3 ' , " > 5 3 ' . 3 / . 3 < 3 % : " : A ; 3 ' \$ M ' : * 3 ' A % A : A ' - 5 % + A % = ' \$ M ' : * 3 ' <) = " . ' N 0 / * \$ < / * " : 3 ' + \$ % \$. ' 5 3 M \$. 3 ' : * 3 ' < > % : * 3 : A I ' . 3 " I : A \$ % \$ I I) . < \$ ' : * 3 ' M % " - < : " = 3 ' \$ M ' / * \$ < / * \$. \$ > < < & * 3 . 3 ' <) = " . ' N 0 / * \$ < / * " : 3 ' A < " 5 3) : ' : \$ ' 5 3 ' . 3 - 3 < 3 + 8 ' f % ' : * 3 ' \$: * 3 . ' * " % + : * 3 ' . 3 - : A ; 3 - > ' y I : \$ < 3 + z ' < : ' : 3 ' \$ 5 < 3 ; 3 + ' A % ' 6 : 6 YK ' < : .) I : . 3 ' ! # 3 > . 3 / . 3 < 3 % : < ' : * 3 ' A % : 3 . , 3 + A : * 3 ' < : ' : 3 ' \$ M ' : * 3 ' I " : " > < < & * 3 . 3 ' : * 3 ' => I \$ < A + A I ' 5 \$ % + A < 3 : * 3 . 5 3 % = 5 . \$ # 3 % +) . A % = ' / * \$ < / * \$. \$ > < < & \$. ' 5 3 % = " M . , 3 + ' +) . A % = ' : * 3 ' < > % : * 3 : A I ' . 3 " I : A \$ % 8 ' ' .

? @ A * B 7 C * \$ " ; * O P C O N 7 D 8 ? @ * - <) & - + - * ; (0 0 & # & " + * 4 (" ; (") * \$ 0 0 (" + 1 * 2 0 * Q ' / 9 J * " ; * 7 \$ * 9 J + 2 * ! * H I J * P \$ < :) + > : \$ ' : * 3 ' A % : 3 . " I : A \$ % ' 5 3 : & 3 3 % ' ! * CYK ' " % + ' H - I N K ' \$. ' 9 " % N K 0 ' 5 % + A % = ' 3 / A : \$ / 3 < " M \$. ' H - I N K ' " % + ' 9 " % N K ' & 3 . 3 ' I \$ % < : .) I : 3 + ' J F A =) . 3 ' a ? ' " % + ' Y L ') < A % = ' : * 3 ' A % A : A " . ' : 3 < " / / . \$ " I * J ! M ' N L ' : \$ " ; \$! + \$; 3 . 3 < A , " : A \$ % ' \$ M ' < & \$. 3 - V A % = / . \$: \$ % < " : - " . = 3 < :) . " : A \$ % : A , 3 < ' " % + : \$ ' 3 - A , A % : 3 ' " % + : 3 M 3 I : ' \$ M ' - A = " % + . 3 5 % + A % = 8 ' a 0 2 ' P * 3 ' 3 / A : \$ / 3 ' , " / < / . \$; A + 3 ' ") " - A : " : A ; 3 ' , 3 <) . 3 ' \$ M ' / . \$ V A , A : > \$ M ' : * 3 ' / . \$: \$ % < \$ M ' : * 3 ' - A = " % + < : \$ ' : * 3 ' / . \$: 3 A % <) . M " 1 3 0 ' & A : * " - . = 3 . ' ; -) 3 < ' A % + A I " : A % = ' , \$. 3 ' A % : A , " : 3 ' I \$ % : " I : 8 ' Z c 2 ' ' .

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P * 3 ' 5 A % + A % = ' 3 / A : \$ / 3 ' \$ M ' 9 " % N K ' J F A =) . 3 ' a Y L ' M \$ - \$ & < ' " ' < A , A - " . ' " % # A % = ' < < 3 3 % ' M \$. ' H - I N K 0 ' <) = 3 < : A % = ' : * " : ' 9 " % N K ' 5 A % + < : \$ ' : * 3 ' < " , 3 <) 5 < A : 3 ' < < H - I N K 0 ' & A : * " " . " : * 3 ' < A , A - " . 5 A % + A % = ' , \$ + 3 8 ' P * A < < A % ' " = . 3 3 , 3 % : & A : * : * 3 ' [0 . " > < : .) I : . 3 ' J F A =) . 3 ' R 6 L ' " % + : * 3 ' \$ 5 < 3 ; " : A \$ % : * " : ' 9 " % N K ' I " " I : " < + \$ % \$. <) 5 < : . : 3 8 ' M , / \$. " % : > 0 ' : * 3 ' - " = 3 . ' + A < / 3 . < A \$ % ' \$ M ' ! P B ' ; -) 3 < ' \$ 5 < 3 ; 3 + ' M \$. ' 9 " % N K 0 ' .

I \$, / " . 3 + : \$ ' H - I N K 0 ' A < " % ' A % + A I " : A ; 3 ' \$ M ' " < * \$. : 3 . ' 3 < A + 3 % 1 3 ' : A , 3 0 ' " % + : * 3 . 3 M \$. 3 ' & 3 # 3 . " M A % A : > \$ M ' 9 " % N K 8 ' ! A % 1 3 ' : * 3 ' \$ % > + A M M 3 . 3 % 1 3 ' 5 3 : & 3 3 % : * 3 ' : & \$ <) 5 < : . : 3 < A < : * 3 ' I \$ % M =) . " : A \$ % " : ' 6 \ 0 ' A : M \$ - \$ & < : * " : ' " " M ; \$) . " 5 - 3 ' A % : 3 . " I : A \$ % 0 ' \$ 5 < 3 ; 3 + ' M \$. ' : * 3 ' " : A ; 3 ' H - I N K 0 ' A < ' 5 . \$ # 3 % 5 > : * 3 ' A % : 3 . < A \$ % A % ' 9 " % N K 8 ' ' .



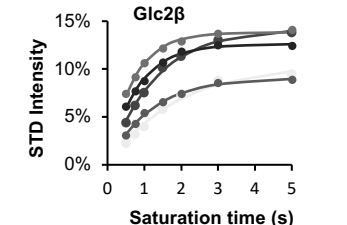
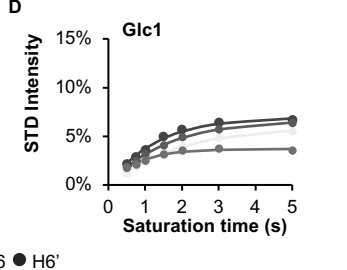
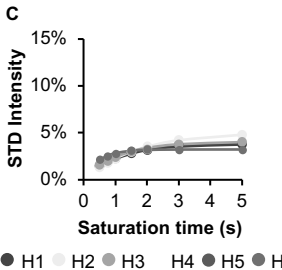
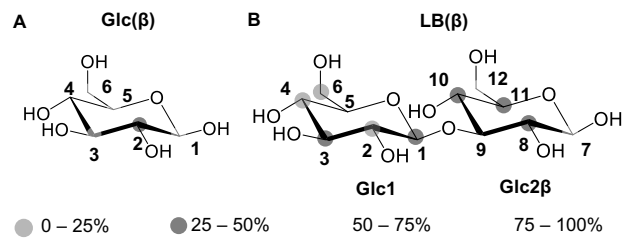
M () < & # Y ? @ A * B 7 C * & L . & # (3 & + - 2 * " Q ' / 9 J * " ; * 7 \$ * 9 J * F D K ' Y % + A % = ' 3 / A : \$ / 3 ' \$ M ' H - I N K ' A % : * 3 ' / . 3 < 3 % 1 3 ' \$ M ' ! * CYK 8 ' F I K ' Y % + A % = ' 3 / A : \$ / 3 ' \$ M ' 9 " % N K ' A % : * 3 ' / . 3 < 3 % 1 3 ' \$ M ' ! * CYK 8 ' 6 \$ - \$) . < . 3 / . 3 < 3 % : ' % \$. " - < 3 + ; " -) 3 < \$ M ' ! P B d ' " : 3 " I * / \$ < : \$ % + 3 / A I : 3 + ' A % : * 3 ' < : .) I : . 3 8 ' F S . 3 " I * " = " % + 0 ' : * 3 ' ; -) 3 < \$ M ' ! P B d ' " : 3 ' % \$. , " - < 3 + " = " A % < : * 3 ' - " = 3 < : ; " -) 3 < J < 3 3 ' P * 5 - 3 ' I Z M \$. : * 3 ' % \$. , " - < 3 + ' I P B d L ' F O K ' 7 V / 3 . A , 3 % : " - > + 3 : 3 , A % 3 + ' ! P B 5 ' A + 0) / ' I) . ; 3 < M \$. ' H - I N K ' 5 % + A % = : \$ ' / * CYK ' J : \$ / L ' " % + ' 6 f E 6 7 9 ? 0 ! P 0 I " - I) - " : 3 + ' ! P B ' A % : 3 % < A : A 3 < J 5 \$: \$, L 8 ' P * 3 ' @ f 7 ' E 0 M " I : \$. ' J E @ f 7 L ' 5 3 : & 3 3 % : * 3 ' 3 V / 3 . A , 3 % : " - " % + ' I " - I) - " : 3 + " + " " A < d b Q 8 ' F A K ' 7 V / 3 . A , 3 % : " - > + 3 : 3 , A % 3 + ' ! P B 5 ' A + 0) / ' I) . ; 3 < M \$. ' 9 " % N K ' 5 % + A % = : \$ ' / * CYK ' J : \$ / L ' " % + ' 6 f E 6 7 9 ? 0 ! P 0 I " - I) - " : 3 + ' ! P B ' A % : 3 % < A : A 3 < J 5 \$: \$, L 8 ' P * 3 ' @ f 7 ' E 0 M " I : \$. ' 5 3 : & 3 3 % : * 3 ' 3 V / 3 . A , 3 % : " - " % + ' I " - I) - " : 3 + " + " " A < d b Z 8 ' F S . ' 3 V / 3 . A , 3 % : " - + " : " 0 1 A I : 3 < < * \$ & \$ 5 < 3 ; 3 + ' ! P B ' A % : 3 % < A : A 3 < 0 ' & * A < : .) I : . 3 < : 3 + 3 : 3 , A % 3 + M \$, ' 3 - < : <) . 3 < M : A % = : \$ ' : * 3 ' 3) " : A \$ % A % ' ! " N 8 ' ' .

6 f E 6 7 9 ? 0 ! P 1 ' I d 2 ' I " % 5 3 ') < 3 + : \$ ' / . 3 + A I : ' ! P B ' A % : 3 % < A : A 3 < 5 ' < 3 + ' \$ % ' " : * . 3 3 0 + A , 3 % < A \$ % " - , \$ + 3 ' \$ M ' : * 3 ' / . \$: 3 A % A = " % + I \$, / - 3 V 0 ' 3 8 = 8 ' + 3 . A ; 3 + ' M . \$, ' [0 . " > ' I . > : " - \$ - . " / * > 0 ' @ 9 E ' < / 3 I : . \$ < I \$ / > 0 ' \$. ' , \$ - 3 I -) . ' , \$ + 3 - A % = 8 ' P * 3 < 3 ' A % : 3 % < A : A 3 < ' I " % ' : * 3 % ' 5 3 ' I \$, / " . 3 + ' " = " A % < : 3 V / 3 . A , 3 % : " - ! P B < : \$ + 3 : 3 , A % 3 ' & * 3 : 3 : * 3 ' , \$ + 3 ' \$ M ' : * 3 ' I \$, / - 3 V ' A < " 5 - 3 ' : \$) " % A : " : A ; 3 - > 3 V / " A % ' : * 3 ' 3 V / 3 . A , 3 % : " - ! P B ' @ 9 E ' + " : 8 ' P * A < ' I \$, / " . A < \$ % ' A < ' I " . A 3 + \$) : ' < A % = ' : * 3 ' < \$ 0 1 " - 3 + ' @ f 7 ' E 0 M " I : \$. ' J E @ f 7 L ' J ! M ' L 8 ' 1 M 2 ' H 3 3 . " - > 0 ' " E @ f 7 ' \$ M ' - 3 < < : * " % d 8 Z ' A < ' I \$ % < A + 3 . 3 + " " = \$ \$ + M : \$: ' : * 3 ' + " : " 8 ' ' .

F\$.'*3'I.>:.'<.:.)I:).3'\$M':*3'H-INK'I\$, /-3V'J9#0#*)=3"L0':*3'
 E@ f 7' &' <'d8dQ'JF=).3'a6L0'A%+A1":A%=' "%'3V13-3%:'MA:'53:&33%'
 :*3'I.>:.'<+3.A;3+', \$+3'I\$, /-3V'"+:.*3'<\$-):A\$%0<:.'3'I\$, /-3V'
 \$5<3.;3+5>'@9E8'F\$.:'*3'I.>:.'<.:.)I:).3'\$M':*3'9"%NK'I\$, /-3V0'
 :*3'E@ f 7' &' <'d8dZ'JF=).3'aBL8'P*3'/\$\$.3.0'>3:'<.:A-';3.>=\$\$+0'
 MA:'A%+A1":3<"'<3<<'&3-0+3MA%3+5A%+A%=' , \$+3'A%<\$-):A\$%0=A;3%:'*3'
 -&3.' "MM%A:>8'

?@A* B7C' (;&"+0(&;*+, &*4(";")*-<4-(+&*02# Q'/*\$";*+, &*
 ;(#&/+(2"\$*4(";")*20HI*\$";*+(-\$/ /, \$#(&*9*2' !HIJ'
 W%:'*3'<.)>+\$M'H-I'5A%+A%='*3'3V1*" "%=3'53:&33%':<j0'" "%+g0'
 "%\$, 3.<'/ .3I-)+3+<.)I*'+3:"<+3+<.)>+0')3':.*3'I\$, 5A%:'A\$%'
 \$M'+MM3.3%:'I\$%13%:.'A\$%<\$M':*3'</3I3<' "%+:'*3'<A=%MM1" "%/'3'#'
 \$;3.-' /' \$5<3.;3+M.\$, '5\$:*' "%\$, 3.<8' S\$&3;3.0'A'<1-3'.'.M.\$, '
 :*3'</3I:.'":*":'":*\$)=*<A, A-.'I\$%13%:.'A\$%<\$M'3'I*'" "%\$, 3.'
 ".3'/.3<3%:0:*3'!PB'A%:3%<A:A3<M.\$, ':*3'j0'" "%\$, 3.'.'.3;3.>.)I*'
 &3"#3.'* "%:'*\$<3M.\$, ':*3'g0'" "%\$, 3.'JF=).3']?' "%+6'" "%+!NNL8'
 P*A'<A%+A1":3<:*":*3'g0'" "%\$, 3.'A'</ .3M3.3%A"->'.3I\$=%<3+5>
 :*3'3%U>, 38' P*A'<)==3<:<3;3.-':A%=<8' Fh.<:>0':*3'<)5<A:3'
 \$I1)/A3+5>'H-INK'" "%+9" "%NK' ,)<.:3_)A.3'" "<)" .NO/*\$</ *":30'
 \$:*3.&<3'A'&\$)-+53'3V/3I:3+':*":' j0H-I'&\$)-+5A%+&3-8'P*A'<
 :*3%' , 3'" "%:'*":' H-I' ,)<:' 5A%+:'\$' "' <3/".:3'<)5<A:30' A%'
 "=.33, 3%:'&A:*'A'<.'\$-3'<:'*3' "I13/.\$'<)5<:.'38'FA%"->:*3'
 <.:.)I:).3'\$M':*A'<)5<A:3' ,)<:'53'<)I*":*":'j0H-I0'&A:*'A'<"VA"-6NO
 +>.\$V>' =.\$/0' A'<)%'5-3:'\$' 5A%+0' /3."/<' +)3:'\$' <:3.AI'
 A%:3." I:A\$%<8'

?<A%<H-I0':*3'.3+) I A%='3%+\$M'CY'3VA<:<"<"%3_)A+5.A) , '53:&33%'
 5\$:*' \$M'A'<:'j0'" "%+g0'" "%\$, 3.<8'?'="A%0'A'<'A'<'\$5<3.;3+*":*":*3'g0'
 "%\$, 3.'<'/ .3M3.3%A"->'.3I\$=%<3+5>:*3'3%U>, 3'JF=).3']Y'" "%+
 !NL8'HA;3%:'*3'/\$/\$<3+.3' I:A\$% , 3I* "%<, "' "%+:'*3'/\$-".A:>\$M'
 :*3'+A<"I1" ".A+30'A'"/3.<:'*":*":*3' %\$%0.3+) I A%=' .A%=' \$M' CY'
 JH-INL' 5A%+<:'\$':*3'< , 3'<)5<A:3'<'<'H-INKs9" "%NK0' &*A'<:*3'
 I\$.3</\$%+A%=' .3+) I A%='<)" .JH-I\gl'5A%+<:'\$':*3'< , 3'<)5<A:3'
 "<'H-I8'P*3'<:)." :A\$%':." "%<I3.3+:'\$':*3'.3+) I A%=' 3%+\$M' CY'
 JF=).3']B0'5\$:\$, L'A' ,)I*':<.\$%=3.'* "%:'*":'.3I3A;3+5>:'*3'
 %\$%0.3+) I A%=' .A%=' JF=).3']B0':\$ /L0'<)==3<:A%=' :*":' :*3' #3>
 A%:3." I:A\$%'53:&33%:'*3'<A=" "%+'" "%+:'*3'3%U>, 3'A'<M.\$, 3+&A:*' *3'
 .3+) I A%='<)" .'*3V/\$>." "%\$<3' , \$I3>8' P*A'< "=".33<' &A:*' *3'
 /3;A\$<'\$5<3.;":A\$%:'*":*3'ON'<)5<A:3' I' "%\$%>'.3I\$=%<3'<)" .'
 NO/*\$</ *":3<'3M3I:A;3>8'



M()<#&'Z?'@A'B7C'&L.&#(3&"+*2"Q'/*\$";*HI5FDK'Y A%+A%='3'/A:\$/3'\$M'H-IJgL'
 A%:'*3'/.3<3%13'\$M'!'CYK8'FIK'Y1%+A%='3'/A:\$/3'\$M'CYJgL'A%:'*3'/.3<3%13'\$M'
 !'CYK8'6\$-\$).<.:3'/.3<3%:'%\$, "A<3+;,"-)<3'<\$M'!PB'":*3'I*/\$<:A\$%+3'/A1:3+
 A%:'*3'<.:.)I:).38'F\$.:'3'I*":*":*3'<:"-)<3'<\$M'!PB'":*3'%, "A<3+;"="A%<:'*3'
 "-.=3<:';"-)<3'J<33'P"5-3'!Z' M\$:'*3'%, "A<3+;"!PB'dL8'FOK'7V/3.A, 3%:"->
 +3.3., A%3+!'PB'5)A+0)/1);3<M\$'H-IJgL'5A%+A%=':\$'!'CYK8'FAK'
 7V/3.A, 3%:"->+3.3., A%3+!'PB'5)A+0)/1);3<M\$.'CYJgL'5A%+A%=':\$'!'CYK8'
 6A.1-3<*&\$5<3.;3+!'PB'A%:3%<:I3<0'&*A'<:1);3<:"3+3.3., A%3+M.\$, '3'<
 <_)<3'<A%<:'\$':*3'3_)":A\$%A%!'!N8**

!PB'@9E'&'<'<-\$'/3.M.\$, 3+5\$%+<A<"I1" ".A+3'9'" "%+!'CYK':\$'
 +3.3., A%3' :*3' A%:3." I:A\$%'53:&33%:'*3' %\$%0I\$=%'<:3'/.3+) I' "%+
 :*3'/.3:A%8' f;3.-'A%:3." I:A\$%'53:&33%!'CYK'" "%+<A<"I1" ".A+3'
 9'A'<A, A-.':\$'":*":' +3<I.A53+' A% CY0' &A:*' *3' , "A% I\$%:" I:<
 "/3".A%=":\$53'&A:'H-I\0'A%/' :.AI)-.'&A:*' *3'S]o<'<'/ .3;A\$<>
 , 3%:A\$%3+M\$.'CYJF=).3'b?' "%+bYl8'P*3' , "=%A:)+3'\$M':*3'!PB'
 A%:3%<A:A3<'<'I\$, /".5-3:'\$':*\$<3'\$M'CY0'<)==3<:A%=' :*3'"MM%A:>A'<
 <A, A-.'8'P*A'< &\$)-+ , "#3'<3%<3'=A;3%:'*":' :*3'H-I\0' I\$, , \$%:'\$'
 5\$:*0'<33 , <:'\$53' :*3' , \$<:'A , /\$-:" "%:'.3I\$=%<A:\$%8'9\$3\$;3.0'
 \$%>:'*3'g0'" "%\$, 3.' 5A%+< <:.\$%=>:'\$' !CYK0' &A:*' *3' !PB'
 A%:3%<A:A3<'<'I\$.' :*3'j0'" "%\$, 3.'53A%=';3.>.)I* '&3"#3'.JF=).3'b6L8'
 S\$&3;3.0':*3'!PB<M\$.' :*3'S]'\$M'9" "%N' ".3'":-\$<:.\$%=3.'* "%'A%'
 H-IN'A%<CY8'P*A'< , ">'53'53I")<3'9" "%5A%+<'A%'" "<A=*:)+MM3.3%'
 \$.A3%:" :A\$%0' &A'<'</.5\$"5>:'\$53'3V/3I:3+)=A;3%:'*3'+MM3.3%'
 <:3.3\$I*3 , A<:>:\$M':*3'6\8**

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H"-NK' "<' "<)"=".'+\$%\$.JfA=).3' \?' PC6' 3%U>, 3' <1.33%A%=L0'
&*A1**"<:'*3' 6R0 f S' A%' "%' "VA"-.' :.*3.' :.*"%' 3_) ".:\$.A-'/<A:.\$%8'
P*3'<' , 3'3V/-"%" :A\$%' I"%' 53')<3+:'\$3V/-"%' :.*3.' I#'\$M' / *CYK'
"I:A;A>':\$&'.+<' H"-NK' " %+' H"-TNK0' 5\$:*' \$M' &*A1* ' ".3'
+3.A;":A;3<' \$M' H"-NK8' 43' I"%' "-<\$' / .3+I:.' &*3:*3.' / *CYK' I"%'
&\$.# '\$%' +\$%\$.<' :.*"%' &3' * " ;3' %\$:' <1.33%3+ A%' :.*A<' &\$.#8' F\$.'
A%<:"%130' =) I).\$%A10' I A+ ' NO/ *\$</' *:'3' JH-ITNK' &*A1* ' *'<'
I ".5\$V>=.) /' <)' 5<A:):A\$%' ":' 6]' &\$.&)-+ '#3->' I")<3'<:3.A1' "%+
3-3I:.\$<:"A1' I" "<3'<' &A:*' 7bZ' " "%+:'*3.3I\$.3' , ">' %\$:' /3. , A:
5%A+ A%=\$M' H-ITNK:' \$' / *CYK8' P*3' A' , /\$:"%13'\$M' 6]' M\$.5'A%+ A%=':\$'
/ *CYK' &' <' 3; A+3%:' M. \$, ' :.*3' <:.\$%=' ! PB' A%:3%<A:3<' " : :.*3'
=3. , A% "-/ .\$.:\$%<' " :.*A<' /<A:.\$%%' A%5\$:*' H-INK' " %+' 9 "%NK8'

Y\$:*' ! *CYK' " %+' 6YK<' &\$.# '\$%' +A" I I * ".A+3<0'5):' &A:*' +MM3.3%' :'
-A%#="3' </3I AMA I A:> J838' ! ON0Z' ;<' ! ON0RL8' S\$&3;3.0' 3' I * 3%U>, 3'
, ">' 3' , /->' " "+MM3.3%:' , 3I * "%< , ' :\$.3<:A1:' :.*3'-3%='* \$M' :.*3'
<)' 5<:." :3s/ .\$.+) I :8' W%' 6:6YK0' :.*3' 3V:3%+3+ ' I" : "->:A1' -\$\$/ ' A<' "'
)%A_)3' I * " . I:3.A<A1:' \$' 6:6YK' :.*' '&' <' %\$:' M\$) %+' A%\$') ! *CYK'
<:.) I:.) 30' %\$.' A%' " %>' \$:*3.' I * " . I:3.A<3+ ' +A<' I I * ".A+3'
/ *\$</' *\$.>' <3<' A%' HSQR' M' , A->8' W:' A<' -#3->:' \$' 53' A% ;\$; +3+ A%' :.*3'
<)' 5<:." :3' </3I AMA I A:> \$M' 6:6YK' &A:*' .3=" .+<:' \$' :.*3' +3=.33' \$M'
/\$> , 3.A<:" :A\$%' \$M' :.*3' / .\$.+) I :8' W%' W%' I \$%:" <0' ! *CYK' I \$%:" A%<' "'
)%A_)3' g0* " A. / A%' k=" :300' &*A1* ' &*3%<) /3. /<3+>' &A:*' :.*3' 6YK'
<:.) I:.) 30' \$; 3. - /<' &A:*' :.*3' /<A:.\$%%' \$M' :.*3' 3V:3%+3+ ' I" : "->:A1' -\$\$/ '
\$M' :.*3' :." :3.8' P*3.3I\$.30' :.*3' g0* " A. / A%' = " :3' A% ! *CYK' , "> /3. M\$. , '
<A , A-.' :.\$-3' \$' :.*"%' \$M' :.*3' 6:6YK' 3V:3%+3+ ' I" : "->:A1' -\$\$/ ' A%'
.3<:A1:A%='*3'+3=.33'\$M' /> , 3.AU" :A\$%8''

W%' <) , , ">0' &3' * " ;3' +3 , \$%<:" :3+>' :.*3' <A , /-3' 3%U> , " :A1'
<>%' :3<A<' \$M' " " %\$%0%):.) .-' +A<' I I * ".A+3' 5>) :A+<A%=' :.*3'
/ .\$. , A<I) A:>:' \$&".+' %\$%01\$%=" :3' <)"=".' NO/ *\$</' *:" :3' \$M' / *CYK'
" %+' / .\$. ; A+3' <:.) I:.) .-' A%<A=" :.*A%:' \$' :.*3' , 3I * "%< , <' &*3.35>:' :.*3'
3%U>, 3' +A<A%=" A<3' <)"=".' NO/ *\$</' *:'3' +\$%\$.<8' f) .)' &\$.#'
/ .\$. ; A+3' <' " :<3// A%='<:\$%3' \$&".+<:' :.*3'+3<A%=" "%+:' 3%=" 33. A%=' \$M'
HK<' M\$. :.\$-3. "%13' :\$&".+<:' \$' :.*3' %\$%01\$%=" :3' <)"=".' +\$%\$.<0' &*A1*'
&A-.' :.*3' />' \$' 3V/ " %+' :.*3' . "%=3' \$M' HK' " / -A1' " :A\$%<' A% I " .5\$*'+. :.*3'
<>%' :3<A<8''

NL.&#(3&" +\$*-&/+2**

NL.#&-(-2**\$)*. #<0/(\$+2**20' *HI Jh'P*3' ! *<. !+IB@?'<3_)3%13' &"<
<>%' :3<AU3+ ' "%+ / \$/A , AU3+ M\$. ?5+ ' 1(A' 3V/ .3<<A\$% J1)<:\$, ' B@?' <>%' :3<A<
>)' H3%Q0' W%18L8' P*3' <3_)3%13' &"<' , /-MM3+5>' K6E' " %+' I :.\$%3+ A%:' \$' :.*3'
K\$/A%F' /< < , A+ ; 3I:.' 1R02')<A%=" W%0F) <A\$% { ' JP"# . " Y!\$0' 9\$) %:" A% m83&0'
6?0' T ! ? L' W\$-\$&A%=' :.*3' , (%) W' I:.) .3.0<' / .\$. \$1\$-8' P*3'.3I\$, 5%A% "%' ! 1=>HFB
! *<. !' &"<:" %<W\$. , 3+ A%:' \$' ?5+ ' 1(A' JYC\N\JB7ZLL' " %+' " "\$%3' I:.) .3' \$M' :.*3'

:"%<W\$. , "%' &"<=\$&%" :." :Zb' 6' A%' CY' , 3+H' &A:*' =" :A\$%' JNcd' / , L') %<A'
f B]dd' ud888' S3:3.\$-\$<)' < / .\$.3I%3V/ .3<<A\$% &' <' <A%+) I3+5>' " ++A%=" W' KPH'
:' \$' " W%0' -' ! \$%13%:" :A\$%' \$M' d8' \ , 9' " %+' A% I) 5' :.*3+ \$; 3. %A=" :.' :Nc' 168' P*3'
I3-<< &3.3' * " . ;3<:3+ J]b\N' V' =0' Nd' , A%L' " %+><3+5>' <A\$% I " :A\$%' A% 5) M3. '
' ?' J\vd' , 9' S7K7 ! ' / S' b8d0' \vd' , 9' @' " 6-L' <) //3 , 3%:3+ &A:*' B@' <' 3' JN'
, =s , -0' ! A= , " L8' !) /3. %:" %:" I \$%:" A% A%=" :.*3' .3I\$, 5%A% "%' / .\$.3I%<' &"<
<3/ " :.*3+ M. \$, ' I3->+35.A<' 5>' I3%:" M) =" :A\$%' JZ\QNR' V' =0' Zd' , A%L0' :.*3%'
) .MM3+>' &A:*' " %' } (P?' /) .3' FKC6' <><3 , ' JH7' S3' :.*1' .3L' " :.' R' [68' P*3'
<) /3. %:" %:" I \$%:" A% A%=" S' k' j0. " =+3+ K<CYK' &' <' \$' +3+ :\$' " NO , ' S' k' P. " / P'
SK' I \$-) , %' JH7' S3' :.*1' .3L' / .303_) A+5. :.*3+ &A:*' 5) M3.3' ?' JNd' , 9' S7K7 ! '
/ S' b8a0' \vd' , 9' @' " 6-L8' P*3' I \$-) , %' &' <' &"<3+ &A:*' 5) M3.3' ?' " %+' 5\$) %+'
/ .\$.3A%<' &"<3-) :3+ A% %\$3' <3/ &A:*' Nd' , 9' S7K7 ! ' / S' b8a0' \vd' , 9' @' " 6-0'
add' , 9' A , A+ " US-38' P*3' < , /-3' &"<W' :.*3' /) .MM3+5>='3' M:." :A\$%) <A%='
" !) /3. +3V' ! \dd' N]s]jdd' I \$-) , %' JH7' S3' :.*1' .3L' 3-) :3+ &A:*' \vd' , 9'
S7K7 ! ' / S' b8a0' \vd' , 9' @' " 6-0' N' , -s , A%8' F. " I :A\$%<' I \$%:" A% A%=" :.*3' / .\$.3I%<
&3.3' / \$-\$3+ " %+' I \$%13%:" :.*3+ \$' Nd' , =s , -') <A%=' ? , A1 \$% ' T:." ONa' Z'd' #B" '
9 4' I:.) :\$M' I \$%13%:" :.*8' P*3' / .\$.3A%<' &"<3+ A% Z'd' w' -A_) \$<:" :.' 0cd' [6'
) %<A' .3_) A.3+8' P\$3' <A , " :3' :.*3' <<3 , 5> \$M' ! *CYK' A% <A\$%) :A\$%0' " I -45. :A\$%'
I) .;3' &"<' =3%3. :3+>) <A%=' <:" %+>' + / .\$.3A%<' M. \$, ' H3' Fh:." :A\$%'
6" +5. :A\$%' (A' S9 4' JH7' S3' :.*1' .3L8' ? / ? . \$VA , " :3-> \ ' , =s , -' \$M' :.*3'
<:" %+>' + / .\$.3I%<' &3.3' " %><3+>' A%+A; A+) ->) <A%=' :.*3' <' , 3' , 3' :.*\$+
+3<I .A53+ M\$. ! ! *CYK' :.\$+3:3. , A%3' :.*3' 3-) :A\$% ; \$-) , 3<8' P*3' <3' ; -) 3<' &3.3'
<.*3%> <3+> :\$' I \$%<:.) I:.' " " -45. :A\$%' I:.) ; 30' W\$-\$&A%=' :.*3' , (%) W' I:.) .3.k<
/ .\$. \$I \$-8''

N"X13 \$4/(\$-\$-1-h' K*\$</' *:'3'.3-3' <3' <<>' 1z2a' &"<' I " :A3+ \$) :.' A% " %'
" <<>' 5) M3.3' J\vd' w-0' Ndd' , 9' S7K7 ! ' / S' b8d0' \vd' , 9' <)"=".' NO/ *\$</' *:" :3'
+\$%\$.<0' Nd' , 9' " I13/ :.\$<0' \dd' , 9' <A\$+) , ' \$>5+ :3L8' P*3'.3' I :A\$%<
&3.3' A% I 5' :.*3+> :.' Ra' [6' W\$. Z'd' , A%) :3<8' ?' I \$%<A\$%) :A\$%' JQd' w-0' d8N' 9' S6-0'
NZ8] ' 9' <A\$+) , ' <1.5' :3L' &"<' +3+> :\$' :.*3' 5\$+3+ .3' I :A\$% , AV:.) 3' " %+
A% I 5' :.*3+ M\$. Z'd' , A%) :3<" :.' \$\$. \$' :3 / 3. :.) 3' :.*3' -\$& I \$-\$+3; 3-\$/ , 3%:8'
' ?' <A\$' <A\$%) :A\$%' JQd' w-0']c' , 9' <A\$+) , ' A' :.' :3' :A5' <A1' +A+> . :30' \ ~ " I3: A1'
" I A+L' &"<' +3+> :\$' :.*3' , AV:.) 3' :\$' <A\$' / :.*3' I \$-\$+3; 3-\$/ , 3%:8' P*3'
' 5<5.5' %13' \$M' M%0' <A\$%) :A\$% &"<' , 3' <) .3+> :.']\vd' , ' \$%' " Q]0&3- / - :3'
.3" +3.8' P*3' " , \$) %:' \$M' / *\$</' *:'3'.3-3' <3' &"<' I -) I:.) :3+> M. \$, ' :.*3'
' 5<5.5' %13' 5' 1\$, / " .A%=" :\$' " / *\$</' *:'3' <:" %+>' + I) .;3' " %=" A%=" 53: &33%'
d0Nd' , 98' ?' -' <<>' &3.3' /3. M\$. , 3+ A% :.' A/ A1' :3<8' (A%3: A1' / " . , 3:3. <' \$M'
K<CYK' &3.3' +3:3. , A%3+) <A%=' :.*3' / *\$</' *:'3'.3-3' <3' <<>' J\vd' w-L' &A:*'
<.*3' 3%U>, 3<' J\vd' a' w= , -L' A%:' :.*3' / .3<3% I3' \$M' d8\0Nd' , 9' \$M' H-1' " %+' Nd' , 9'
H-INK' \$' 9' "%NK8' P*3' " , \$) %:' \$M' / *\$</' *:'3'.3-3' <3' M. \$, ' :.*3' <<>' &3.3'
, 3' <) .3+> " %+> :.*3' ; -) 3<' &3.3' M: :3+> \$%' %\$%0-A%3' " . :3=3<<A\$% &A:*'
9A1* " 3+<0 93%:3% , \$+3') <A%=' H. " / *K' +A' K< , '\$+3:3. , A%3' D , -v' " %+> @ .8'
P') 2- \$// , \$#; &\$' \$1- (h' PC6' &"<' /3. M\$. , 3+5> < /> :A%=" :.*3' .3I\$; 3.3+>
.3' I :A\$% , AV:.) 3' Jdba' r-L' \$%:' \$' " <A1' " / - :3' JNd' I , ' V' a' I , L0' :.*3' 3-) :3+>
) <A%=" " , \$5+3' / *' <3' I \$%:" A% A%=" @ S' r f S' h' S \ f ' h' %' 10/ . \$/ " %\$' JZ\NhRL' A% " "
<3' :3+>=" <<' I \$%:" A%3. W\$. \ ' \$') :.' \$' -\$& \$+=\$ " I I * ".A+3' <3/ " . :A\$%8' P*3'
/ - :3' &"<' " A.0+ .A3+> " %+> :." A%3+ &A:*' \$' I A%\$-0' &*A1* &"<' / .3/ . :3+5>' " ++A%='
I \$%13%:" :.*3+>) -) A1' " I A+> J\vd' , -L' :\$' A13' I \$+> <A\$%) :A\$%' \$M' Zla0
+A+> . \$V> :\$-) 3%3' JZ]d' , =L' A%:' 3' :.*\$% JNd' , -L' " %+> &"<3' JNd' , -L8' P*3'
<:" A%3+ / - :3' &"<' :.*3' *3' :3+>) %<A\$' \$+=\$< " I I * ".A+3' < /> <' &3.3' ; k<15-38''

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I\$\$.+4%":3<0'.30<3:4%=:3 /, /3." :).3" I:\$.<0'"%+'.30.3M%4%=: '\$I\$%:3.=3%13'
Jf(=) .3' !NRL8?'-<(:.) I:). "M(=) .3<'&3.3' / .3' .3+)' <4%='66KR9H8'ba2'
?@A#B7C'?'-<" /-3<'&3.3' / .3' .3+)'&B\ f'&A:*'\a, 9'P.A<0+M\ /S'b8R'
"%+!\$%:"A%3+M%"/. :\$.34% "%+!A=" %+!\$%13%:." :\$%<\$'ad'r 9'"%+!]' , 9'
.3</3I:A;3->8?'-3V/3.A, 3%:<'&3.3' /3.II\$. , 3+)' :'\bc' ('\$%' 'Y.)#3.'?; "%13'
MMM'cdd' 9SU'</3I:\$. , 3:3.'3_) // /3+)'&A:*'\a0 , 'P[I]'cdd' 9SU'S06s@0B0
da'n'YP f' /.\$538' !PB'@9E'3V/3.A, 3%:<'&3.3' /3.II\$. , 3+)' <4%='":. "A%\$' \$'I'
ad' , <'H')<<A'"% /)<3<' // +3+'\$%':*3' \ \ I * "%%3-' :':3:3.'d8c' // , 'J\$%0
.3<\$% "%13! '\$' Rd' // , 'J\$M' .3<\$% "%13L8' ?' </ \$+<3_)3%13' &'<'<3+>'\$'
+3<:.\$>)' %&'&3+>' , "=3%<:" :\$%' "%+>' "/A%-\$I#&'&'<'<3+>'\$<'<' // .3<<'
/.\$:34%<4%="<'Jc:++MM8ZL8'P*3' .3I>I-3+>'3+'J+NL'&'&'<3:':\$'a'<8'P*3'\$:'-
<:"). :\$%' :A, 3' "%+>') , 53.' \$'I' <I'"%<' &3.3' <3-3I:3+>' "II\$.+4%=: '\$:' *3'
II\$-\$&4%=<I *3 , 3h'

Table with 7 columns: @2+\$\$, d8a', d8ba', N', N8a', \', Z', a'. Row 1: ?\$+<#\$+(2** @ (3&f-K*

B25?/\$ -* aN\ ' aN\ ' \a)' \a)' N\c' N\c' N\c'
J#&.\$#\$(2** 20' 32; &'-h' 6.><:'-.' <:.) I:).3<' &3.3' A, /\$.:3+)' A%:\$'
! ! * , +4%=3.' 9 "3<:.\$'b)2'"%+ / .3' .3+)'&A:*'\a0.3'K.\$:34%K.3' / ". :\$%' 4AU' .+8'
?-' %\$%0/ .\$.34% '\$' %\$%0A=" %+>' :\$. , <' &3.3' .3 , \$; 3+8' K.\$:\$%<' &3.3' : *3%'
"++3+>'\$':*3' , \$+3+0')<4%=' KE f K (?') \$' / .3+I:.' *3' / .\$.:\$% ':\$%' <:" :3' \$'I'
/ \$' -' <+3I * "A%<' :.' / S' b8'bb2' P *3' * >+.\$=3%05\$%+4%=" %3:&\$.# ' &'<'
):\$. , "A: ! ->' \$' :A, <+3+>'5>' -.\$&4%="<' / ". =4%30' =) :). , A%3' "%+>' * :<+4%3'
<+3I * "A%< : '\$' 53' M\A / 3+8' P *3' , \$+3+>' &'<' : *3%' , A%4, <+3+>')<4%=" : *3'
f KC' I Z'bc2'II\$. I3' M\A+>' "%+>' " *3' ;>' :\$. , ' I\$%:3.=3%13': *3<*-\$' \$'I' d8Z' t 8'
! A%13' ! PB'@9E'3V/3.A, 3%:<'&3.3' /3.II\$. , 3+)'&B\ f 0' / \$' -' / .\$.:\$%<'&3.3'
.3 , \$; 3+M\$. , ' : *3' A=" %+>' / .A\$:' \$' f E 679 ?0! P8'] d2'

OPCON7D8?@' O\$' /<\$+(2 -E' K.\$:34% I *3 , A: ! -' <' A: <' &3.3' I -I) :." :3+>'
)<4%=" : *3' ! SIIP [\ ' 'b02' &35<3. ; 3' " II\$. +4%=: '\$' 3V/3.A, 3%: " -' I\$%+>:' \$%<8' ?-'
/ .\$.34% / .\$.:\$%<'&A: *A%Na' t \$'I' : *3' A=" %+>' &3.3' I\$%<+3.3+)'&A:*'\a0' : *3' I -I) :." :\$%8'
P *3' A%<:.) , 3%: ' M\A+>' <:.' 3%=: *0' <\$: ; 3%: ' :> / 30' A=" %+>' I\$%13%:." :\$%0' "%+>'
/ .\$.34% I\$%13%:." :\$%&3.3' <3:.' " II\$. +4%=: '\$' 3V/3.A, 3%: " :.' ; -) 3-8' P *3' M.33'
"%+>'5\$)' %+>' A=" %+>' I\$.3. " :\$%: :A, 3<' &3.3' 3<:A, " :3+>'\$' 53' d8Z' %<' "%+>' Zdd'
%<' .3</3I:A;3->0'5' <3+>'\$%' .3<-\$% '5-3'; "-) 3<M\$. ' " , \$%\$<' II * " .A+3'54%+4%="
:\$' " '\dd' #B' / .\$.34%8' P *3' %\$%0</3I M\A I '3' #="3 &'&'<'<-\$' / \$' :A, <+3+>'\$' d8c'
<08' P *3' A%<3% : " -' I\$.3. " :\$%: :A, 3' &'&'<3:':\$' Nd' /<' "%+>' *3' , 3: * >0 ['\$. +3.
/ " . , 3:3.' &'&'<3:':\$' d8ca0' " II\$. +4%=: '\$' / .3; A\$) < > /) 5A< *3+>' ; -) 3<8'] d2' ?-'
/ .\$.34% / .\$.:\$%<'&A: *' .3<\$% "%13<'53:&33% d8'] ^N' // , ' &3.3' I\$%<+3.3+>'\$'
53' A%<:" %:" %3\$) < > <'< :). " :3+>'\$' " II\$) %:' \$' :A' -4%3'5.\$'+3%4%8=8' F\$. '=) I\$<3'
N0' *\$< / * :30' : *3' 3_) +45.A) , ' I\$%<:" %:" %+>' #5% &3.3' \$' / :A, <+3+>'\$' \ addd' 9^0
N' "%+>' Nd' 9^0 <^0N' .3</3I:A;3->8' F\$. ' 9' %NK0' : *3' 3_) +45.A) , ' I\$%<:" %:' &'&'<'
.3+>' I3+>'\$' N] ddd' 9^08' Y\$:' * ; "-) 3<' " .3' A%>' =.33 , 3%: ' &A: * : *3' " M\A%4:&3<
> / A: ! ->' \$' 5<3. ; 3+M\$. ' I' .5\$ * >+." :3054%+4%=" / .\$.34%<8'

D/\ '2 : '&;) &3 &' +*

P *A<' &\$.' # ' &'&'<'<) // \$.:3+>'5>' : *3' T (' YY! E6' I %<:A:) :3' ! : " :3=A: I'
K.\$=." , ' \$%' T %+>3.<:" %+>4%=" "%+>' 7V / -\$A:4%=" 93: " 5\$A< , ' J97PL'
1Yy6DddRa] N8N2' : *3' T (' YY! E6' 0' 7K! E6' " %+>' I %<0%\$; " :3T (h'
IY6 " : ">: ' 1Yy6 9 d QdZRN2' : *3' D\$ * %' I %<3<' F\$) %+>' :A\$%' "%+>' : *3'

E\$>' -' P * " A' H\$; 3. % , 3%: ' ! ! * \$ -' <' A' / / .\$. =." , 8' D8' ?8' "%+>' ! 8' 4 8'
" I # % \$ & -3 + = 3' M) % + 4% = " M. \$, ' : *3' Y! E6' : * \$) = * " ' .3 <3' . I * = . "%: '
JYy6KdNd]] dsNL' "%+>' " ' ' BPK' K * B' <:) +3%< * A / 0' .3</3I:A;3->8' 43'
" I # % \$ & -3 + = 3' : *3' B A " , \$ % + ' C = : * ' ! \$) . I3' I I \$. " " I I3 < < : '\$ 53' , -4%3 < '
Mdz' "%+>' MDR') % + 3' / . \$ / \$ < -' 9 [NZR] b' &A: * <') // \$: ' M. \$, ' : *3'
7) . \$ / 3' % ' 6 \$, ,) %A: > j <' ! 3; 3%: * ' F. " , 3 & \$. # ' K. \$ = . " , '
JFKbs\ ddb\ ^ dNZL') % + 3. ' H. " %: ' ? = .33 , 3%: ' \ cZabd' JY\$! : .) I:0 [L8'

J&1: 2#; -h' -" , A% " .A5!\$<3' / * \$ < / * \$. > -' <3' , '3%U> , " :A: I < > %: *3 < < , '
<: .) I: .) -' 5A\$-\$> = ' => I\$ < > * > + . \$ -' <3' M' , A: > ' QR'

- 1N2' m8'K) I * " :0' . \$ 12# ' 8\$1(5+L095'R^9Y'0'MM0' \ N^ \ b] 8'
1\2' 78'68' f 0@3+>'0'E8' ?8'F(3+>'0'6 "3&18>035+ F#*5'R^9Y'0'NOM' \ Z^ \ Zb8'
1Z2' H8'K3.= \$UU0' ! 8' () *) + \$, -' / 0' E8' ?8'F(3+>'0'78' (" :A: " 0' / 312##5: ! # =25+
<#225'R^9[0'PNO'] Q] ^ b d Q8'
1R2' S8'@ "# " 0' 98' (A: "\$# " 0' Y8' ! ; 3%<<\$%0' (8' f * <:) 5\$0' 6] 335+ , = \$5+68#45+
. \$ 15' R^9S'0' QR0' Z d N^ \ Z d Q8'
1a2' 98'SA. "A< * A0' (8' M = " < * A0' ! 8' (A ,) . " 0' 98' 4 " + " 0' 98' (A: "\$# " 0' 98'
! " , 3A , " 0' 6 "3&18>035+ F#*5'R^A'W0' MNN0' \ R] c^ \ RbZ8'
1J2' X8'X": "# " 0' P8' ! " & " + " 0' P8' ! 3.AU & " 0' < "\$: 4) I3' R^9Z0' MP0' NdN \ d^
NdN \ a8'
1b2' P8'@ \$ * " . " 0' P8' ! " & " + " 0' S8'P" % "# " 0' P8' ! 3.AU & " 0' C5+ . \$ 14 "2#35+E' 15+
! / > 45+ ? 05' R^9 [0' PS0' Q \ a^ \ QZC8'
1c2' P8'@ \$ * " . " 0' P8' ! " & " + " 0' S8'P" % "# " 0' P8' ! 3.AU & " 0' < "\$: 4) I3' R^9Z0' MP0'
N \ a \ d^ \ N \ a \] 8'
1Q2' 68'H\$3+>'0'P8' ! " & "%=& " %0' 98' 9) 3-3.0' ?8' ! ! * & . " 0' Y8' @+3:U#>'0'
L\$: # T5+68#4# #B4#25+ ? 05' R^A^_0' NR0' Nddc'] ^ NddcQ8'
1Nd2' 98'@< * A , \$: \$0' 98' (A: "\$# " 0' . \$ 1 * 15+ . \$ 12# ' 8\$1(5+ . \$ 1' 8#45'R^A^ [0' RQ0'
\ NdN^ \ NdR8'
1NN2' (8'Y33.3%<0' (8' B3' 4 A%<3.0' B8'm" % B3' 4 " -30' 68'H.\$\$: "3.0' ! 8'
(" , A\$=-) 0' C8' 9A: I-:30' P8'm" % B3' 4 I33'0' D8'm" % 6 " , / 0' (8'
B3&3:4% I#0' P8' B3< , 3:0' C5+ L: 3' 5+H110+68#45'R^9 [0' VM0'] dZd'] dRN8'
1N\2' 98'@ "# " 8A , " 0' S8'P\$>\$AU) , A0' (8' 2530' S8'@ "# " 0' S8'P" =) I * 0' 98'
(A: "\$# " 0' ! <1E+ , \$ # R^9U0' X0' 3Q \ ZaZ8'
1NZ2' 98' (A: "\$# " 0' X8' 9 "<:) \$ # " 0' (8' 9\$. A0' 98' @< * A , \$: \$0' (8' S" > " < * A0' . \$ 1 * 15+
. \$ 12# ' 8\$1(5+ . \$ 1' 8#45'R^9R0' R0' ZRZ^ \ ZRc8'
1NR2' 98' (A: "\$# " 0' P8' ! " < " # A0' S8'P" % =) I * A0' C5+ . \$ 1' 8#45'9WWR0' QQP0' Rd^ \ RR8'
1Na2' X80' (8' A , 0' 98' (A: "\$# " 0' 98' (. < * % " .3+>+>'0' X8' 9\$. A0' (8' S" > " < * A0' C5+
. \$ 1' 8#45'R^A^R0' QMP0' NQb^ \ dZ8'
1NJ2' 98'E3A: I *3%53I *3.0' F8' C\$: < > / 3I * 0' (8' Y. \$%<3% , 3I3.0' ?) 35+ C5+
. \$ 1' 8#45'9WW [0' PNR0'] \ \] b8'
1Nb2' X8' S\$%+ " 0' 98' (A: "\$# " 0' (8' S" > " < * A0' . \$ 1' 8#45+C5'R^A^U0' MRR0' \ \ a^ \ \ 8'
1Nc2' P8'@ * A . " 0' X8' ! "A: \$0' 98' @< * A , \$: \$0' 98' (A: "\$# " 0' (8' M = " < * A0' (8'
f * <:) 5\$0' S8'@ "# " 0' H ? . E: <#225'R^9S0' WSR0' Zaa' ^ Za] N8'
1NQ2' (8' B3' 4 A%<3.0' H8' B3&A: :30' 98' 78' B. A. #<0\$M , 3<:3.0' ! 8' B3' C' 3:0' S8'
K3. " %: \$; ...0' m8' (+3%0' P8' B3< , 3:0' C5+ L: 3' 5+H110+68#45'R^9Y'0' VM0'
NdNZN^ \ NdNZQ8'
1\ d2' (8' B3' 4 A%<3.0' C8'm" % E3%:3.= *3 , 0' (8' 4) > < > 0' S8' K3. " %: \$; " 0' m8' (.3%0'
4 8' ! \$3: "3.0' P8' B3< , 3:0' L095+E> \$28+6' 2 " 5' R^9Y0' MWR0' NQ] N^ \ NQ] Q8'
1\ N2' (8' S" ,) . " 0' 4 8' ! " 5) . A0' ! 8' ?530' @8' 9\$. A , \$: \$0' S8'P" =) I * A0' S8' 9\$. A0' S8'
9 "<:) A0' . \$ 1 * 15+ . \$ 12# ' 8\$1(5+ . \$ 1' 8#45'R^9R0' R0' cN \ ^ \ cNc8'
1\ \2' (8' 6 * \$; ; \$%<0' m8' (\$. + I 0' [8' C A0' ! 8' Y ") 3.0' ?8' 78' H: -3< / A30' ! 80D8' S " 0' 78'

f *0'D8'9'8'H"-."U#*0'X80'8'D'80'D8'S8'B'6":30'. #12#'8\$1(5+. #1)/#"
R^A9U0' R0' B f #N8bNNc]sNbaR0']cZR0b0ca8'
1\Z2' (8'(A%\$0'E8'!"#30'P8'9\$A. "<:0'!8'()).<:0'X8'!*A, #U)0'98'!"\$0'
(8'(A.A.)."0'. #1*'#5+. #12#'8\$1(5+. #1'8#45'R^A_0'RP0'\RNNa^\RNb8'
1\R2' D8'(8'K".#0'@8'f'8'(3>*"#0'!8'E\$<3, "%0'C5+. #1(5+68#45'R^A^0'PRW0'
ZZdbb^ZZdcZ8'
1\A2' S8'H8'P."%0'P8'B3<, 3:0'(8'!"3.3%<0'S8'4"3=3, "%0'!8'
m"%+3#3.1#*\$;30'98'B0*\$=\$*30'18'm"%Y\$="3..0'48'!\$3."3..0'
.#13#*1)35+Y#'#8\$1(5'R^A9R0'QW0'cR^cb8'
1\J2' S8'@#"#0'98'?'S"i*3, '0'Y8'f'8'K3:3.<3%0'X8'43<:/"-0'(8'
9"%%3.<3+0'98'D8'Y"), "%0%0'?'8'B+\$#/#, \$-0'S8'8'!i*\$<0'D8'^8'
B))<0'Y8'!;3%<<\$%0'. #1'8'4!#R^A9^0'XP0'NcNc^Nc\]8'
1\B2' 98'Si+="#0'98'(A:"\$#"0'(8'S">*<0'P8'4"#=#0'S8'!*\$)%0'!8'
F)<*\$%\$5)0'. #1'8#45C5'R^A^0'MXS0'Zb^RZ8'
1\c2' 68'98'Y^A#*1*3::0'@8'C8'7<3%0'Y8'H8'F\$V0'H8'@8'K^*+//<0'L'2"+
63>*2"((1:35+E#'#25+H+E23)'25+. #1(5+63>*25+6144)\$R^A990'VR0'NZRa^
NZRQ8'
1\Q2' 98'Si+="#0'X8'S\$S\$+"0'98'(A:"\$#"0'!8'@A."<"&"0'(8'S">*<0'P8'
4"#=#0'S8'!*\$)%0'!8'F)<*\$%\$5)0'E23)'2)3#R^A^0'QP0'QZb^QRb8'
1Zd2' 78'68'f@3+0'H8'K3.=#U0'68'78'98'!;3;3%<\$%0'B8'98'C"&<\$%0'!8'?'8'
@3/\$=\$+I3;0'E8'?'8'F+3+0'6"3&18>035+R^A9[0'NWQ0'NcNc^NZ\8'
1ZN2' 98'@#"#eA, "0'@8'P"#0'@8'F).)#"&"0'P8'@A^A."0'X8'(\$+):<, #0'X8'
P"#*"#<0'@8'!)=#, \$-\$0'?'8'9">#"="0'!8'F)<*\$%\$5)0'S8'P"=)i*0'S8'
@#"#180'E'#5+R^A9[0'R0'B f #N8bNNcZc5.3/R\]bN8'
1Z\2' X8'4'8'@", '0'P8'@A^A."0'P8'?"#&"0'X8'!"A:\$0'98'(A:"\$#"0'S8'@#"#0'!8'
F)<*\$%\$5)0'C5+. #1(5+68#45'R^A90'PX0'Nc\cNc^Nc\Q\8'
1ZZ2' !8'F)<*\$%\$5)0'98'Si+="#0'?'8'98'S">*<0'P8'4"#=#0'S8'!*\$)%0'98'
(A:"\$#"0'C5+L=##Z/>'1*'#5'R^A90'WS0'QNA^Qb8'
1ZR2' 98'E8'98'B3'H.\$3;30'98'B3'Y"3.30'C8'S\$0."I#0'P8'B3<, 3:0'78'D8'
m"%+ , , 30'48'!\$3."3..0'!312##\$?>5+. #1*#5+E#5'R^A^0'PP0'QZ^ZQ08'
1Za2' 98'E8'98'B3'H.\$3;30'H8'S8'P."%0'?'8'm"%S\$S.353#30'D8'!:\$)0'P8'
B3<, 3:0'!8'@8'!" ; ; ;+3<0'48'!\$3."3..0'L\$"#5+. #1'8#45'R^A9^0'NOQ0'
N]\^N]b8'
1Z]2' 98'E8'98'B3'H.\$3;30'P8'B3<, 3:0'48'!\$3."3..0'C5+. #12#'8\$1(5'R^A990'
QW0'\aZ^]d8'
1Zb2' 98'9">3.0'Y8'93>3.0'L\$:#75+68#4#B0\$25?05'9W0'0'MS0'NbcR^
Nbcc8'
1Zc2' 98'9">3.0'Y8'93>3.0'C5+L45+68#45+E1'5'R^A90'QPM0'Ndc^]NNb8'
1ZQ2' 68'B8'f&3%0'C8'78'P"iH.\$+0'!8'9\$%"I\$0'P8'%)=-\$0'C8'm")V0'E8'
C"-3, 3%:0'n8'(*3+0'S8'X)0'(8'C3I\$1%:30'D8'4"-<*"&0'!8'P.i5\$-50'98'
S\$..3V0'?'8'Y3-0'[8'6*3%0'H8'C8'P">\$.0'?'8'm".#0'D8'?'%=-)\$0'8'D)=30'
-"25+6144)\$R^A9[0'S0'B f #N8bNNcZc5.RNR]b0dNbd\NdQ0c8'
1Rd2' D8'68'9)\$S\$U0H".i<"0'98'D8'H".i<"0Dh, (E%3U0'K8'6"..3.\$0'?'8'6"%"-3<0'
D8'Dh, (E%3U0Y".53.\$0'98'9".:0%0C\$, "<0'?'8"||, 53.:>0'D8'C8'+3'K"U0'D8'
?'%=-)\$0'S8'C\$.:":0D"i\$50'K8'98'@I3:\$0'Z/>'1&1(1:>R^A90'PM0'NddR^
NddQ8'
1RN2' X8'X)"%0'[8'43%0'B8'?'8'E8'!"%+3.<0'Y8'98'K1%:\$0'. #1'8#4'23>'R^A^0'
NN0'NRdcd^NRdcd8'
1R\2' X8'X)"%0'B8'4'8'Y-3+30'[8'43%0'B8'?'8'E8'!"%+3.<0'(8'W:\$'0'S8'4'8'C4)0'
Y8'98'K1%:\$0'C5+L45+68#45+E1'5'R^A_0'QMO0'ZNa^ZN]c8'
1RZ2' 98'H8'!U1U3/1%0'E8'Y8'n*3%0'H8'68'6\$, /-3:0'P8'C8'C&#&".>0'Y8'98'
K1%:\$0'68#4. #168#4'R^A^0'Q00'\da^\daQ8'
1RR2' D8'?'%=-)\$0'Y8'C"=#/"0'?'8'Y", 30'P8'Y13:0'Y8'93>3.0'@8'E", ''
(.k.*%0'8'K3:3.<0'98'98'K"-I10'P8'K3:3.<0'C5+L45+68#45+E1'5'

R^A^0'QPS0'NZa\Q^NZaZc8'
1Ra2' !8'98'C8'H"=#%\$%0'98'!8'H8'C3==0'@8'!%+*)&#%":."0'D8'?'8'C3:<0'?'8'E8'
D\$*"-0'Y8'!i*), "%0'!8'@8'Y\$<.<3;0'98'98'K"-I10'P8'K3:3.<0'!8'm'
7; "%<0'Z/>'1&1(1:>R^A9[0'PR0'Q]^\Qbb8'
1Rj2' 78'68'f@3+0'?'8'98'E" <+0'68'78'98'!;3;3%<\$%0'?'80'8'S3:.)0'?'8'K8'
H)%%A%#0'98'E3U3#0'!8'?'8'@3/\$=\$+I3;0'!8'Y\$.%3, "%0%0'B8'98'
C"&<\$%0'E8'?'8'F+3+0'68#45+E'#5'R^A9U0'W0'ZRN^Zad8'
1Rb2' !8'()*)+\$, "-./0'@8'D8'K":.\$%0'Y8'S3%<.<0'98'E3U3#0'H8'
!"-5"i*0'E8'?'8'F+3+0'C5+. #1(5+68#45'R^A9_0'PXM0'\c]a^\cb]8'
1Rc2' @8'!8'Y3..\$&0'B8'?'8+3:.\$%0'!8'!"%<5).>0'D8'@3:3<0'8'0'E8'
?'<3%53.=0'@8'E"* , "%0'B8'18'!:)..:0'E8'D8'f&3%<0'-)'(#'+L'10'+
F#*5R^A^0'MW0'B f #N8bNNcZc5%".s=#, dRb8'
1RQ2' F8'@8'?'&"+0'K8'C"5\$.+0'98'4"%#0'?'8'98'C)0'i8'cA0'n8'K8'6"0'c8'C4)0'
D8'm\$=-, 3L0'. #1'8'45+. #1=8>*5+L'2'+B+Z#5+E)&#R^A9[0'QSVQ0'Z\ZN^
Z\Zb8'
1ad2' K80'78'D"%"<<\$%0'D8'C%+53.=0'H8'4++ , "-.0'L'2"+68#45+E'"\$05'9WWS0'
NR0'bNN^bNa8'
1aN2' E8'!;3%):U'1%'. #1\$/\$134"2#'+13+Z/>'1&1(1:>)"\$0+Z/>'14'!)*L\$+
U\$2310)'2i'J7+<8h'68048';\$%+3.'C13:0'P8'C*::3#30'98'F."%#L0'
4+3>0Y-"I#&3-0'@3&D3.<3>0'R^A^0'/8'ZNN^Z\8'
1a\2' K8'6\$<\$%0'E8'E8'(A%#0'6"3&18>035+R^A9[0'NR0'N^NZ8'
1aZ2' 98'T8'E\$<-)%+0'78'!Z&E%0'D8'C"#+<.: , '0'D8'E.%%\$<0'(8'S8'98'
D\$%<<\$%0'98'C)%+5\$.=0'98'm8'!;3%<<\$%0'H8'4++ , "-.0'6"3&18>035+
F#*5R^A90'MNV0'NZNN^NZNQ8'
1aR2' 98'T8'E\$<-)%+0'K8'PZ':A%3%0'98'@I3, A:U0'E8'!e, *\$-.0'6"3&18>035+
F#*5R^A^0'MNM0'NdN^NN\8'
1aa2' 78'(.k.<3%3-0-)'(#'+L'10'+F#*5R^A90'NM0'B f #N8bNNcZc5%".s=#;ZNR8'
1a]2' ?8'm"%S\$S.353#30'D8'!:\$)0'D8'(>+0'98'B3'H.\$3;30'18'BAV0'P8'
B3<, 3:0'48'!\$3."3..0'D8'm"%Y33), 3%0'!8'@8'!" ; ; ;+3<0'L'2"+
63>*2"((1:35+E#'#25+H+E23)'25+. #1(5+63>*25+6144)\$R^A90'VW0'ZR\^
ZaN8'
1ab2' X8048'@", '0'P8'@A^A."0'P8'?"#&"0'X8'!"A:\$0'98'(A:"\$#"0'S8'@#"#0'!8'
F)<*\$%\$5)0'C5+. #1(5+68#45'R^A90'PX0'Nc\cNc^Nc\Q\8'
1ac2' P8'!"&"%\$0'48'!5).#0'(8'S"), '0'S8'9">0'S8'9\$0'10'H?'.EiC5'
R^A9S0'PS00'RR]Z^RRbZ8'
1aQ2' D8'?'%=-)\$0'K8'98'7%.(_)3U0@", "<0'K8'98'@I3:\$0'68#45?>35+C5'R^A90'
QW0'bcdZ^bcN\8'
1jd2' m8"D">"-#<*, #0'@8'E8'(.k.*%0'C5+^".:\$5+R^A90'QW0'Nd]^\
NNc8'
1jN2' @8'E8'(.k.*%0'B8'H8'?=-.3:<0'D8'B8'H+I#<\$%0'E8'4"-3.0'. #1=8>*5+C5'
9W[0'PM0'bQN^cNR8'
1j\2' B8'?'3:<0'P8'F8'm3.*"3=0'Y8'18'E\$, "%0'68'm8'!;3;3%<0'P8'B3<, 3:0'
48'!\$3."3..0'6"3&18>035+R^A90'MNV0'Nc]d^Nc]b8'
1jZ2' P8'@A^A."0'X8'!"A:\$0'98'(A:"\$#"0'98'@k^A, \$-\$0'(f:<)5\$0'S8'@#"#0'
6"3&18>035+R^A90'MVQ0'RQ^aR8'
1jR2' F8'@8'?'&"+0'K8'C"5\$.+0'98'4"%#0'?'8'98'C)0'i8'cA0'n8'K8'6"0'c8'C4)0'
D8'm\$=-, 3L0'. #1'8'45+. #1=8>*5+L'2'+B+Z#5+E)&#R^A9[0'QSVQ0'Z\ZN^
Z\Zb8'
1ja2' 48'("5<i*0'L'2"+63>*2"((1:35+E#'#25+R^A90'VW0'\a^NZ\8'
1j]2' H8'41%:3.0'C5+L=##Z/>*2"((1:35'R^A90'NM0'Nc]^\NQd8'
1jb2' K8'E8'7; "%<0'H8'@8'9).<*)+\$;0'L'2'+63>*2"((1:35+E#'#25+R^A90'VW0'\a^NZ\8'
1jc2' K8'!#)5...#0'@8'!8'K"%)0'-. #25+6144)\$R^A9S0'ND0'N^8'
1jQ2' H8'98'!3+.#1#0'L'2"+63>*2"((1:35+E#'#25+L+H1)\$05+63>*2"((1:35'R^A^0'

