

>Y`Ybh_YnÅg A chj 1Wj g`Yj Å`



A chj 1Wj g`Yj Å`! ? YnXÅg

Ub[c`

8YUF`G]fž

<]j Uu cgž ZÅFZ] VĚa nYtž]ga YfYhYb`bÅj

Z]bb

< njÅ`< YffUž

8YUF`A UxLa ž

<]j Uu cgž b] VĚa nYtž]ga YfYhYb`bÅj

< njÅ`F ci j Už

8YUF`G]f`#A UxLa ž

<]j Uu cgž VĚa nYthbYj Y`Åg`bYa Y]ga YfYhYb

< njÅ`j UgtUbcHtU`Už

8YUF`G]fž

<]j Uu cgž h`OW`VĚa nYth

< njÅ`hj UgtUbcHtU`Už

Hc`k` \ca`]hia UmVĚbWfbož

<]j Uu cgž VĚa nYthY`_`bYj Y`Åg`bYa Y`hY`YgYb]ga YfYhYb

< njÅ`hj UgtUbcHtU`Už

8YUF`A f`Ga]hž

<]j Uu cgž ZÅFZ] VĚa nYtž]ga YfhibÅj

< njÅ`\YffUGa]hž

8YUF`A fg`Ga]hž

<]j Uu cgž b] VĚa nYtž` \`½Už]ga YfhibÅj

< njÅ`fci j UGa]hž

8YUF`A]gg`Ga]hž

<]j Uu cgž b] VĚa nYtž`Y[mYXØ ½`ĭ ž]ga YfhibÅj

< njÅ`bY]h`Ga]hž

8YUF`A g`Ga]hž

<]j Uu cgž b] VĚa nYtž]ga YfhibÅj ž]ga YfYhYb`VgU ½] ½`Udch

< njÅ`bY]h`#fci j UGa]hž

8YUF`>c\b`Ga]hž

? Yj ÅgVÅ` \j Uu cgž a ½`fÅ[YW`ĭ HUj Ub`Øn`Yh`_`UdVg`Uh

< njÅ`>c\b`Ga]hž

=k]g\`hc`Udd`mZcf`hY`dcgicZ` k` \]W`mci

UXj Yfh]gYX`]b` cb` ""

GHubXUFX`Zcfa i` \UY[mic`mub`½`½`gUž`Ua Y`nbY`_`U`\fXYhÅg`hY[mĪ`g]½`VUbj U[mia U[Uh]bVUb`½`hUX

< Ui U]g]b`]`a U]gU`_]]bbcg]`_g]b`]` `dU]__Uj UfHbž

`cgU]`a c]h]hY`

=La` k` f]h]b[]b`fYgdcbgY`hc`mci` f`UXj` Yfh]gYa` Ybh

dcgYX`cb

GHubXUFX`Zcfa i` \UY[mcb`]bY`\]fXYhYthi`½`½`gUj` ½`Ugnc`½`g`cf

?]f`c]h]La` a` Y]hY`Y`]]h]hYb`""

>Y Ybh_YnÅg A chj 1Wj g`Yj Å



=fYZf'hc'mci f'UXj YfhgYa Ybh]b XUHYX "" J]]hUub]'a c]h _gYbbY""dÅj Åm_gY'hÅ""
GhUbXUX'Zcfa i `U'bbU_`Ya U[nUf'1/2]1/2\c[m\c`'hU 1/2hUX'Ua Y[\]fXYhYh1/2 1/2h

=fYUX'mci f'UXj YfhgYa YbhZcf'Ub`Yl dYf]YbWX]b @i]b]'a c]h _gYbbY`c_YbYgU""""\XYgÅ""""U
h.Y]gg Y'cZ k]h [fYUh]bYfYg']]bbcg]i]b'g i fYg]"
GhUbXUX'Zcfa i `UY[mc'mub'1/2 1/2]U`Y Ybh_YnÅg_cfZ'Ua YnYhY[mia U[Uh]bVUb'j U[m\Yf]'UdVUb`'1/21/2

=\Uj Y'd`YUg fY]'b'Udd'm]b['Zcf'h'Y'UXj YfhgYX A]bi ``Ucb]'c`U_YU'hÅhÅ]'a c]hYh U'dU__Užg]'Å""
dcbg]h'cbZ'Ug
GhUbXUX'Zcfa i `U'1/2 1/2]Y Ybh_YnÅg_cf

=k ci `X``_Y'hc'Udd'mZcf'h'Y'dcbg]h'cb'cZ <Ui U]gb`U_YU""dU__U""
GhUbXUX'Zcfa i `U'1/2 1/2]Y Ybh_YnÅg_cf

7i ffYbhmi=Ua `k cf_]b['Zcf` UbX'a m Hnög_YbhY'Yb'hÅ`Å\Yh_Y`Å""Uj Ugi i Ui Y]g]b]
fYgcbg]V]'h]Yg]bVM XY]i i i i ""
Bm]h' `a cbXUh`Åbh\Ugnb'1/2 1/2`U`Y Yb`Y[]'Zc[`U_cn]g] 1/2 Udch`Yf'1/2]U

A chj 1Wj g`Yj Å!`¥fj YÅg

Ub[c` Z]bb
=Ua `dUfhW`Uf m]bYfYgYX]b'h.]g`cVZ'Ug C`Yb_]bbcg]i bi h'Åg'hÅmög'ÅYf]m]g]g]g]_g]žY'hÅ""
5 bbU_`Ua Y[a U[nUf'1/2]1/2\c[mia]ÅfhgnYfYhÅX'Uh'UXctha i b_1/2

=k ci `X``_Y'hc'k cf_`Zcf'mci ž]b'cfXYf'hc <Ui U]gb'hnög_YbbY`Å'hY]'Åž`cg_U""
5 bbU_`Ua Y[a U[nUf'1/2]1/2\c[mia]ÅfhgnYfYhÅX'Uh'UXctha i b_1/2

A mgfYb[h.g]UfY J U]j i i _g]b]'_i i i j Uh""
5 ``Y[Zcbhc]UW'h `UXcbg]1/2 U]X`Yf'1/2]U_cf

=k ci `X'gUmh'Uha mcb`mik YU_bYgg#k YU_bYggYg 5]bi h#U]bcUh`Y]__ci hYb]'cb'#cj Uh""ž'a i HUH'Yb'hQ]hÅ
UfY ""'6i h=Ua ``cc_]b['hc']a dfcj Y]b'h.]g#h.YgY dUfUbhU_gYb]'bÅ]hÅ"
UfYU#g'
I hU'1/2]U[mYb[YgÅ[Y]XfYžXY'UbbU_`a i hU'1/2]U\c[mgnYfYhÅ`YnY_Yb`U'hYfØYhY_Yb`ZY^ Xb]

=k ci `X'W'k Y`'g]hYX'hc'h'Y'dcbg]h'cb'VWU gY Gcd]gb`\nj]b'hÅ`Åb'hÅ'hÅj ÅÅbž`cg_U""
5 bbU_`Yf'1/2]U\c[mia]h`j U[m'f`Y Ybh_Yn `Ua i b_1/2

A chj 1Wj g`Yj Å`

5`hci [\`=\Uj Y'bc'dfY] ci g'YI dYf]YbW`]b ž= \Uj Y`UX

J UJ__U'a]bi ``UY]`c`YU]_U]gYa dUW`_c_Ya i gU`ngY]gYgÅ U]gYUz`c`Yb`hmöj_YbbY`nm!""

5a]_cf`a Å[`bYa `Xc`[cni½Uh`UXcthiYfØYHbzXY`gnYfYbÅX`VYa i HUbj`U'a ½g`HYfØYHY`Yb`gnYfnYHhUdUgnU`U]XU

A midfcZYgg]cbU`ei U]Z]W]h]cbg`#g_]`g`UddYUf`rc`VY k Y`g]HYX`rc`nci f`Vta dUbm]f]fYei]fYa Yb]g'

5a a UH`]]gYh`XY`nm]gYb]j U]_i HUj Uhgcd]j Ub nfi]hm]gYbY]j UH]a i _g]b"

5 bbU`_U`Yf½g]Uz`c[mia]`mYb`_ÅdYggÅ[Y`_hYgnbY`_U`_U'a Ugg]½U'a i b_½U

8 i f]b[`a m]ja Y`Ug`""ž=]a dfcj YX`#Z fH`YfYX`# YI HbXYX`#a m_bck `YX[Y`cZ

Hnöj_YbbY`YggÅb]`""dUfUbg]b`#YX]g]b`#`UU`Ybg]b H]Yrc`Ub]`""

9[mUXcthiYfØYHYb`gnYfnYHhUdUgnU`U]hVYa i HU½g]U`Åg`U`_ÅdYggÅ[`Ö`_ÅdYggÅ[Y`_#i X½g]gnYfnÅgÅfY

A mUfYU`cZYI dYf]gY`]g

5g]Ubh bHYa i _gYb]`_Yg_]Hnmf!""

5 bbU`_Yf½g]Uz`c[mia Ymj`_HYfØYHYb]j UbbU`_U`Y[bU] ncv`W`YfYXa ÅbmY]Xz`HdUgnU`U]X

K `]`ghk cf_]b[`Uh` `=VWVa Y`][`mVta dYHYb]b`

Hnöj_YbbY`YggÅb]`""`Ub_]b`dÅH]j nmXYb`""

9[mUXcthiYfØYHYb`gnYfnYHhUdUgnU`U]hVYa i HU½g]U`Åg`U`_ÅdYggÅ[`Ö`_ÅdYggÅ[Y`_#i X½g]gnYfnÅgÅfY

9j Yb`k `Yb`k cf_]b[`Uh`][`gdYXž`=Xc`bchbY[`YVh UWV`fUW]hUbX`k ci `X`h`YfYzcfY`VY`dUf]W`Uf`m g]HU`Y`Zcf`h`Y`Xya UbXgcZk cf_]b[`Ug` "

9XYg_]j Ubb`hmöj`U`X]b`YXYggÅ`Yb`_U]a]b`nö HUf`_Uj U]g i HUz`_U`c`]g]b`g]g]Yf]HÅ]b`gcd]j U`HÅa Åb hmöj` UH]a i _g]b`""

5 bbU`_Y`a U[mUf½g]Uz`c[mia]ÅfH`YbbÅ`_`U`_½`½g]U`_cf]½V]`a i b`_U`dUgnU`U]X`U`U`d`½b

9j Yb`i bXYf`dfYgg fY`=VWb`a U]bhU]b`][`]`g`UbXUfXg'

GUj i HUb`_cf`_YU]g]g]U`h`_c`_g]U`a nöj`_cj Ub`dU]b`Yb U`_U

5 bbU`_ÅfnÅ`_Y`HYÅgÅfYz`c[m_ÅdYg]j U[mia U[U]g][ÅbmY`_Yh]h`a UgnH`_`ÖfomYnYHYb`Xc`[cnb]

5bX`hi g`=k ci `X`Uj Y`h`Y`cddcfhi b]m]rc`Vta V]bY a m]bhYfYg]g]k]h`h`g]d`UW`a YbH'

G]g]`U`i U]g]b`_]b`a U`Xc`]]g i XYb`m`X]g]ÅÅ]]bbcg]i _gYb`_c`hYb]`HÅ`Åb`hmöj`Cb`"

5 bbU`_VYa i HU½g]Uz`c[mignYa Å`mYgYb`]g]bU[ncb`ÅfXY`_`Xgn`U`a i b`_U]f]½h

=\Uj Y`U`]] Ym]bhYfYg]b`_`UbX`k ci `X`UddfVW]UHY h`Y`cddcfhi b]m]#W`UbW`rc`VfcUXYb`a m_bck `YX[Y Vmik cf_]b[`k]h`nci "

C`Yb`Yf]HÅ]b`_]bbcg]i bi h`""`U`Uf] cg]U]g]b`g]i fYg] a U`Xc`]]g i HU`_UU`YbHU`h]YHÅa ng]Åb]`U]`Y]g]U hmöj_Ybh`Ya Å`_Å`_Ubg]UbbY`"

5 bbU`_VYa i HU½g]Uz`c[mignYa Å`mYgYb`]g]bU[ncb`ÅfXY`_`Xgn`U`a i b`_U]f]½h

5g]nci `Wb`gY`Zfca`_a mYbWcgYX`fÅg] a Åž`a m YI dYf]YbW`UbX`ei U]Z]W]h]cbg]a UW`h`g]d]g]h]cbf]g]fYei]fYa Yb]g'

? i Hb`]]HYbÅ`c`Yj U]g]U`Ubg]c`i YHY`cg]U`bÅ`nmž`_c_Ya i _gYb]`gY`_Å`XY`nm]gYb]j U]g]U]j Uh`U]m]i b`dU]_Ub j UH]a i _g]U`"

5 n`ÖbÅ`YfU`ncX`_]Ub[gÖ`ncn½g]U`_cf`Åg]UbbU`_ÅfnÅ`_Y`HYÅgÅfYz`c[ma Ybbm]fY]`YbY`cn]½Yn`U`a i b`_U

>Y Ybh_ YnÅg A chj 1Wj g`Yj Å`



@c[]Wj`h]b_]b[

@cc[]bYb`U`UHYi

5 n`Y_`AdnY`ÅgY`#ChYHY`dfVW`h`Åg`f`i``h]`cbXc`hia`i`Xcbj`U`i`gnYf`Ygnh`ÅgY`Z`CognYfU`_1/2U

5 bU`mh]Wj`g_]`g

5 bU`nmh]gYh]U]Xch

? ÅngÅ[`U`Xc`[`c`_`f`Ågn`YHYg`Åf`h`Å`Y`Åg`ÅfY

; ccX`]bhYfdYfgcbU`g_]`g

< nj`Ah`]a`]gg` \XYH]Xch

5 `c`_`Å[`1/2`_`U`j`U`i` \`U`h`Å`cbmY[mØ`ha` _`Ø`Åg`Åg`_`ca`a`i`b]`_`Wj` fUj`U`i` `ÅngÅ[

BY[ch]U]cb`g_]`g

BYi`j`chYi`_`nj`nm

A`1/2j`1/2`U`h`c`_`U`j`U`i` \`U`h`Å`cbmØ`h`YHY`Åg]`_`ÅngÅ[`

DfYgYb]h]cb`g_]`g

9g]`bma`]g]U]Xch

5 `ÅngÅ[`Z`c`[`migc`_`Ya`Vf`Y` `h`i`_`ÅdYg`\`U`h`Å`cbntub`Y` U]b]`U`h`Ch`YHY]h

A chj 1Wj g`Yj Å`! @Yn1E1g

Ub[c`

Z]bb

=la` \][\`mia`chj`UHY`UbX`cc`_`Zcfk`UFX`h`c`h`Y`
j`U]YX`k`cf`_`k` \]W`U`d`cg]h]cb`]b`n`ei`f`V`ta`d`U`bm`
k`ci`X`c`Z`Z`f`a`Y`

C`Yb`Å`Åf]a`a`Å]gYb`a`chj`c]h`bi`h`U`c`X`c`h`u`b`g`i`fYg]`
a`cb]di`c`]g]U`h`h`h`Åj`]Å`z`c`]h]U`n]f]m]gYb]bY`h]f`c]Ua`U`d]U`_`U`
h]f`c]U]g]`

@Yn1E1g]1/2`a`Y[]ga`ÅhY`j`Y`z`c`[`mia`Y`b]n]f]Y`gnYfYb]Å`Uj`1/2`U`U`b]U`_`Xc`[`c]n]b]`

=gY`bYk` `h]g`_`g`#`h]g]d`cg]h]cb`U`g`U`k`Y`V`ta`Y`
W`U`_`Y`b[`Y`z`k` \]W`=`cc`_`Zcfk`UFX`h`c`

B`Å`Y`b`i`i`X`Y`h`h`h`h`Åj`Åh`#`h`Åa`Åb`d]U`_`U`b`h`f]j`Y`h` ``Y`b]U`
\`U`U`g]Y`b]U`z`c`h`U`c`X`c`h`u`b`g`i`fYg]`

@Yn1E1g]1/2`a`Y[]ga`ÅhY`j`Y`z`c`[`mia`Y`b]n]f]Y`gnYfYb]Å`Uj`1/2`U`U`b]U`_`Xc`[`c]n]b]`

=k`ci`X`k`Y`V`ta`Y`h`Y`c`d`d`c`f`h`b]h]m]t`c`X]g]W]g]g]Z`f`h`Y`f`
X]Y]U]g]c`Z`h`Y`d`c]g]h]cb`k`]h`n`ei` `d`Y`f`g`c`b`U`m`i`

<`U`i`U]g]b`a`]Y`Y`Å`b]`a`U`X`c`_`]g]i`X`Y`b`_`Y`g]i`g]Y`U`
h`h`h`Åj`]Y`b`m`g]h]m]g`c`X]g]U`_`U`b]g]l`b]b`Y`Y`b`_`]`Q`c`h]U]g]g]`

@Yn1E1g]1/2`Z`Y`j`]`U`b]h]b]`Y[`m`Y`Y`h]g]Å[`Y`g]b]h`Y`f`Ch`

D`Y`U`g]Y`Z]b`X`a`m`f`Åg`a`Å`#`7`J` `U`h]U`W`Y`X`

<`U`_`Ya`i`_`g]Yb` ``]]h`Y`b]Å`a`n`Ø`g]U`b]g]c`i`Y`h`Y`c`

G`h]b]X`U`F`X`Z`c`f`a`i` `U`U`b]b]U`_`Y`E`f]g]h]U`z`c`[`m]U`7`J` `U`W`g]U`r`c`a`1/2`m`U`b]j`U`b`

=W`b]g`d`d`m`f`Y`Z`f`Y`b]W`g]Z`f`c`a`]Z`f`Y`e]i`]f`Y`X`

J`c]b`h`c]a`]h]U`U`a`n`Ø`g]g`c]g]h]i`_`g]U`h]f`d]Y`b]h`i` ``Y`b` `` ``

G`h]b]X`U`F`X`Z`c`f`a`i` `U`U`f]U`z`c`[`m]b]n]f]h]c]h]j`U[`m]f`Y`Z`f`Y`b]W]1/2`U`X`1/2`g]h]U`

F`Y`Z`f`Y`b]W`g]W`b]V`Y`f`Y`e]i`Y`g]Y`X`Z`f`c`a`

G`i`c]g]h]i`_`g]U]j`c]d`n`m`h`Å` `` ``

5`b]b]U`_`Y`E`f]g]h]U`z`c`[`m]h`X`g`n`c]n]b]f]Y`Z`f`Y`b]W]1/2`h]Å`g]z`c`[`m]_`h]_`Y`f`Y`g]Y`b]Y`_`Å`f`Y`

