

## 7c]bVUgY`Yfk UfhYh`bUWX`ghUf\_Ya `E ( `Y]b k Y]WXYfYg `YfghYg`E i UfhU`

 $8]Y'IbhYfbY\a YbgZØ\fib['gdfUW\k\A\fYbX']\fYf'`YhnhYb$ HY`YZcb\_cbZYfYbn'ØVYf'l a gUhnX]j Yfg]Z]n]Yfi b[ ž'B: Hg'i bX  $5_h]Yb_i fg: \emptyset fi b[g_fAZhYgY YbCdYbGYUb]WXhUg$ Ui dh\_cb\_i ffYbhYbž'XU'Yg'XYb'B: H!A Uf\_hd`Uhn'j cfVYfY]hYhž i bX'ghY``Yb'ZYghž'XUgg'Yg']a 'Ui ZghfYVYbXYb'6YfY]W\'j ]Y`Y ; Yk ]bbYf [ YVYb k ]fX C Vk c \ `7c]bVUgY Ua 8cbbYfghU[UVYbX'Y]b ghUf\_Yg'l a gUhn! i bX 6Ybi hnYfk UWXghi a ']a 'j ]YfhYb E i UfhU`a Y`XYhYž'gU[hYb  $: \emptyset \setminus fi b[g_f A Z h Y Z X U g g g] Y ] a Y f g h Y b E i U f h U ``a ] h Y ] b Y a$ FØW\_[Ub[XYfacbUh]WXYbHfUbgU\_h]cbgVYbihnYfibXXYg [YqUa hYb'< UbXY`qj c`i a Ybq'fYW\bYb"'5`Yq]U'< UUqž'7\]YZ :  $]bUbW]U^CZZ]WYf^{\dagger}_{i}$  cb.7 c] $bVUgY\check{z}^{\dagger}_{ghY}^{hY}^{k}$  À\fYbX'XYf HY`YZcb\_cbZYfYbn'XYg'l bhYfbY\a Ybg'Ua '8cbbYfghU['ZYghž XUgg XYf k Y ] W X Y f Y H f Y b X ž X Y f ' ] b ' X Y b ' Y f g h Y b ' A c b U h Y b ' X Y g  $JV fYg^8.$  % in  $VYcVUW hYb^k Ufž^hY]^k Y]gY^Ui Z^b]YXf][YfY]$ / Ua d∧Y``]d/

- 8]Y'l bhYfbY\a YbgZØ\fi b['gdfUW\'k À\fYbX']\fYf'`YhnhYb HY`YZcb\_cbZYfYbn'ØVYf'l a gUhnX]j Yfg]Z]n]Yfi b[ž'B: Hg'i bX 5\_h]Yb\_i fg
- : Ø\fi b[g\_fàZhY'gY\Yb'CdYbGYU'b]W\h'U`g
   < Ui dh\_cb\_i ffYbhYbž'XU'Yg'XYb'B: H!A Uf\_hd`Uhn</li>
   j cfVYfY]hYhž'i bX'ghY``Yb'ZYghž'XUgg'Yg']a 'Ui ZghfYVYbXYb
   6YfY]W\'j ]Y`Y'; Yk]bbYf'[YVYb'k]fX

CVk c\``7c]bVUgY`Ua '8cbbYfghU[UVYbX`Y]b`ghUf\_Yg`I a gUhn!'i bX 6Ybi hnYfk UW\ghi a ']a 'j ]YfhYb`E i UfhU``a Y`XYhYž`gU[hYb : Ø\fi b[g\_fÀZhYž`XUgg`g]Y`]a 'YfghYb`E i UfhU``a ]h`Y]bYa 'F ØW\_[Ub[XYf`a cbUh`]W\Yb`HfUbgU\_h]cbgVYbi hnYf`i bX`XYg`[YgUa hYb < UbXY`gj c`i a Ybg`fYW\bYb"

5`Yg]U`<UUgžī7\]YZ: ]bUbW]U``CZZ]WYf'j cb`7c]bVUgYžghY``hYk À\fYbX`XYf'HY`YZcb\_cbZYfYbn`XYg'I bhYfbY\a Ybg'Ua8cbbYfghU[`ZYghž'XUgg'XYf' kY]WXYfY 'HfYbXž'XYf']b`XYb`YfghYbAcbUhYb`XYg`\*J\fYg'&\$&&`ni 'VYcVUWXhYb`k Ufž'hY]`kY]gY`Ui Zb]YXf][YfY`DfY]gY`ZØf'?fmdhcUb`U[Yb`ni fØW\_ni ZØ\fYb']gh"8Yf'DfY]gjcb`6]hWc]b`ni a '6Y]gd]Y``]gh'gY]h`9bXY`&\$&%`i a 'ZUgh'&\$`i [YZU``Yb"

8]Y'a cbUh`]W\Yb'HfUbgU\_h]cbgbi hnYf'fA HI gŁ``]Y[Yb']a 8i fW\gW\b]hh'VY]'Yhk U'%\$'A]``]cbYbž'i bX'XUg'I bhYfbY\a Yb'\Uh Y]bYb'Yfk UfhYhYb'A HI!6YfY]W\'ZØf'&\$&&'nk]gW\Yb') 'A]``]cbYb i bX'%) 'A]``]cbYb'ZYgh[Y`Y[h"'A HI g'YffY]W\hYb']a 'j]YfhYb'Ei UfhU` %%ž('A]``]cbYb"

I bhYfXYggYb`\Uh`7c]bVUgY`V]g`\Yi hY`Y]b`< UbXY`gj c`i a Yb'j cb Yhk U`&\$\$`A]``]UfXYb`I G!8c``Uf'j YfnY]W\bYh"`8Ug`< UbXY`gj c`i a Yb VY`]YZ'g]W\`]b`XYb``YhnhYb`XfY]`A cbUhYb`XYg`\*J\\fYg`&\$&%`Ui Z ]bg[YgUa h') (+`A]``]UfXYb`I G!8c``Ufž'k Ug`Y]bYf`GhY][Yfi b[`j cb 79C '6f]Ub '5fa ghfcb[ 'gU[ hYž'Yf'VYhfUW\ hY '5VgW\ k Øb[ Y 'b]W\ h a Y\f'U`g' ?fmd hc!K ]b hYf ž'i b X'j Yfk ]Yg'Ui Z'X]Y'ni bY\a Yb XYb 5bk Yb Xi b[ gZ\ ``Y'Z\ Øf'?fmd hc'Ui  $\$  Yf\U`V'XYg' < Ub XY`gž'k ]Y'B: Hg i b X'XYnYb hfU`]q]YfhY': ]b Ub nYb'fB Y: ]Ł"

8 Ugʻ[fÒ» hYʻDfcV`Ya ž'XUgʻk]fʻ\UVYbž'VYghY\h'XUf]bž'b]W\h
XUfØVYfʻbUW\ni XYb\_Ybž'k Ugʻ]bʻY]bYa ʻVYgh]a a hYbʻE i UfhU`
dUgg]YfYbʻk]fXžʻgcbXYfbʻk]Yʻk]fʻhUhgÀW\`]W\`X]Yʻ; fÒ» Yʻi bXʻXUg
5 i ga U» ʻX]YgYfʻ; Y`Y[Yb\Y]hʻYfZUggYbž'X]Yʻg]W\`i bgʻV]YhYhžʻk Ybb
Ygʻgcʻj]Y`Yʻ; YgW\ÀZhga Ò[`]W\\_Y]hYbʻ]a ʻK Yfhʻj cbʻa Y\fYfYb
A]``]UfXYbʻ8c``Ufʻi a ʻi bgʻ\Yfi a ʻ[]Vh" ʻYf\_`ÀfhYʻ5fa ghfcb["

## 9]b\_ca a Yb X]j Yfg]Z]n]YfYb

CVk c\``X]Y 'HfUbgU\_h]cbgY]bbU\a Yb 'bUW\ 'k ]Y 'j cf'XYb @Ok YbUbhY]``XYf'9]bbU\a Yb 'j cb'7c]bVUgY 'Ui ga UW\Ybž'VYa Yf\_hY <UUg'XYb': c\_i g'XYg'I bhYfbY\a Ybg'Ui Z'X]Y '8]j Yfg]Z]n]Yfi b[ gY]bYf'9]bbU\a Yei Y``Yb']a '\\J\f'&\&\"

8]YgYg'GY[a Ybh'a UW\hY'+'ı 'XYg'BYhhci a gUhnYg'XYf ?fmdhcd`UhhZcfa ']a '\\\f'&\\$\"Ui gž'[Y[YbØVYf'('ı ']a 'Jcf'U\f"

8 Ugʻl bhYfbY\a Ybʻ\UhhYʻ9bXYʻXYgʻzJ\fYgʻ' ž\*ʻA]``]cbYbʻBi hnYfž X]Yʻa ]hʻ]\fYbʻJYfa Ò[Ybgk YfhYbʻFYbX]hYbʻYfn]Y`hYbʻʻZØbZa U``gc j ]Y``k ]Yʻ]a ˈzJ\f`&\$&\$`]bg[YgUa h"`

K ]f'd`UbYbž'bcW\']b'X]YgYa '≯U\f'5ggYhg'k ]Y'X]Y'9H<'ZØf ≠bgh]hi h]cbYb'ni 'ÒZZbYbž'i bX'k ]f'd`UbYb'Ui W\ž'k Y]hYfY'5ggYhg'i bX a Y\f'DfccZlcZlGhU\_Y!?YhhYb'\]bni ni ZØ[Ybž'Ub'XYbYb'6Ybi hnYf hY]`bY\a Yb'\_ÒbbYb ž'gU[hY'<UUg"

## 7c]bVUqY'j Yfqi g'CdYbGYU3

: Ø\fi b[g\_fÀZhY`gU[hYbž'g]Y`Yfk UfhYb`a Y\f`U`g`Y]bYb`; Yk]bbYf Ui Z`XYa `YbhghY\YbXYb`B: H!A Uf\_h`fb]W\h`Zi b[]V`Y`Hc\_YbŁ"

7c]bVUgY'[UV']a 'C\_hcVYf'VY\_Ubbhž'XUgg'Yg'Y]bYb'B: H!A Uf\_hd`Uhn Y]bZØ\fYb'k ØfXYž'XYf'Yg'XYb'6Ybi hnYfb'Yfa Ò[`]W\Yb'k ØfXYž'X]Y?fmdhcUggYhg'ni '\_Ui ZYbž'ni 'dfÀ[Ybž'ni 'dfÀgYbh]YfYb'i bX'ni YbhXYW\_Yb"

9a ]`]Y`7\c]ž`DfYg]XYbh'i bX`7\]YZ`CdYfUh]b[ `CZZ]WYf'j cb`7c]bVUgYž VYa Yf\_hY`VY]`XYa `5bfi Zž`XUgg`g]Y`i bX`UbXYfY`]a `I bhYfbY\a Yb [fc»Y`: Ubg `j cb`CdYbGYU`g]bX"`7c]bVUgY`JYbhi fYg`k Uf`Y]b ZfØ\Yf`=bj Yghcf`Ui Z`XYa `B: H!A Uf\_hd`Uhn"

K ]f'gY\Yb'j ]Y`Y'A Ò[`]W\\_Y]hYb'ZØf' ⇒bcj Uh]cbYbž'OUbXQK ]f [`Ui VYb'XYZ]b]h]j 'b]W\hž'XUgg'X]Yg'Y]b'Bi``gi a a Ybgd]Y``]gh ž'ZØ[hYg]Y'k À\fYbX'XYg'HY`YZcbUhg'\]bni "

< Yi hY \_ObbYb X]Y @Yi hY Ui Z 7c]b V UgY \_Ui ZYb Z Ui Z
Y]bY 6f]Y ZhUgWX Y ØVYfk Y]gYb i bX X Ubb ni a
A Uf\_hd`Uhn [ Y\Yb / K Ybb g]Y X Ug U``Yg ]b Y]bYf 5 dd
a ]h Y]b d UUf ? `]W\_g hi b \_ObbYb Z ]gh X Ug Y]b
; Yk ]bb"</pre>

5fa ghfcb[ 'gU[ hYž'XUgg'B: Hg'k Y]h'ØVYf'X][ ]hU`Y'?i bghk Yf\_Y \ ]bUi qk UW qYb'k YfXYb"'

9g'k]fX'j]Y`Y'; Yk]bbYf'[YVYb ž'gU[hY'XYf'79C"' K Ybb'G]Y'Y]bDfcXi\_h'UiZ'XYb'A Uf\_h'Vf]b[Yb'ibX'Y]b'UbXYfYg'DfcXi\_h'UbZUb[gÀ\b`]W\'Uigg]Y\hž'bY][Yb'g]Y'cZh'XUni ž'a]h'XYf'NY]hUigY]bUbXYfni[Y\Yb'ibX']f[YbXk Ubb']\fY'Y][YbYb'B]gW\Yb'niZ|bXYb"

K Ug`\Uh'Yga]hXYa 7C=B!DfY]g'Ui Zg]W\3

±bZUh]cbžN]bggcf[Yb'i bX'[Ycdc`]h]gW\Y'GdUbbi b[Yb' 'k]Y'X]Y

Øb[ghY'±bj Ug]cb'Fi gg`UbXg']b'XYf'I \_fU]bY' '\UVYb']b'XYb'`YhnhYb

A cbUhYb'ni 'Y]bYa '5i gj Yf\_Ui Z'k UW\ghi a gghUf\_Yf'I bhYfbY\a Yb

VY][YhfU[YbžYf\_`ÀfhY'<UUg"

K ]f'j YfghY\Yb'XUg'Y\f`]W\"[YgU[h'b]W\h'k]f\_`]W\ ž'gU[hY'<UUgž XU'X]YgY'?cffY`Uh]cb'XUg'K UW\ghi a 'i bgYfYg'A Uf\_hUbhY]`g'b]W\h VYfØW\_g]W\h][h' 'X]Y'8]j Yfg]Z]n]Yfi b['i bgYfYg'; YgW\ÀZhg'ØVYf ≠bj Ygh]h]cbYb'\]bUi g'i bX'[Ubn'ni 'gW\kY][Yb'j ca 'ni \_ØbZh][Yb DchYbn]U`i bgYfYg'; YgW\ÀZhgž'k Ybb'k]f'Yl dUbX]YfYb']b'bYi Y 5qgYhg'i bX'bYi Y'DfcXi \_hqhfÒa Y"

п ч п

8Yf'6Y]hfU['7c]bVUgY'Yfk UfhYh' gWkkÀWkYfYg 'YfghYg'Ei UfhU` bUWk'ghUf\_Ya 'E(']gh'\_Y]bY'Z]bUbn]Y``Y'6YfUhi b["

8 Y hU1`a

6 Ygi WX Yb 'G]Y 'i bg 'Ui Z. '\_fmd hc!bYk g"Uh