## 9a ch]cbU`Yf'5VgWX]YX. H\fcb'i V]`Ài a j cb'; fc»\Yfnc['<Ybf]']a ': c\_i g

; fc»\Yfnc['<Ybf]'i bX'A Uf]U'HYfYgU'ZY]Yfb'&) '\J\fY FY[YbhgW\UZh']b'9gW\.'9a ch]cbU'Y'NYfYa cb]Yb'i bX ZYgh`]W\Y'<Ò\Ydi b\_hY'Ua 'BUh]cbU'ZY]YfhU["



9gWW. \*\*Ub `XYf`5`nYhhYž\*@i I Ya Vi f[ '!'; fc > \Yfnc[ '< Ybf]'i bX; fc > \Yfnc[ ]b `A Uf]U `HYfYgU `Yf`YVhYb `Y]b `Ai > Yfgh VYk Y[ YbXYg K cWXYbYbXY `Ub`Agg`]WX `XYg`&) "`H\fcb^\* V]`Ai a g" `5a `&&" `\*j b] &\$&) `k i fXYb `]b `9gWX `Ub `XYf`5`nYhhYž`XYf`nk Y]h[ fO > hYb `GhUXh @i I Ya Vi f[ gž'j YfgWX]YXYbY : Y]Yf`]WX\_Y]hYb `UV[ Y\U`hYbž`X]Y `XUg Ya ch]cbU`Y `9bXY`]\fYf`5a hgnY]h'a Uf\_]YfhYb" `8]Y `9fY][ b]ggY i a ZUgghYb `nU\`fY]WXY `hfUX]h]cbY``Y `NYfYa cb]Yb ii bX `OZZYbh`]WXY 5i Zhf]hhYž`X]Y `VY]XYb `X]Y `h]YZY `J YfVi bXYb\Y]h'a ]h`]\fYa `J c`\_'j cf 5i [ Yb `ZØ\fhYb"`

'8Yf'5b`Ugg'k Uf'b]W\h'bi f'Y]bY': Y]Yf'XYg'&)!'À\f][Yb
FY[]Yfi b[g'l V]`Ài a g'j cb'; fc»\Yfnc['<Ybf]ž'gcbXYfb'Ui W\'XYf
BUh]cbU`ZY]YfhU[ž'XYf'gma Vc`]gW\'XYb'ÒZZYbh`]W\Yb'; YVi fhghU[</pre>

XYg'<YffgW\Yfg'XUfghY``hž'XYf'bib'+\$'\\\fY'U`h'k]fX"'8]Y
: Y]Yf`]W\\_Y]hYb'VY[UbbYb'a]h'Y]bYa'AcaYbh'XYf'6Yg]bbib['UaBUh]cbU`Yb'8Yb\_aU`'ZØf'K]XYfghUbX'ibX'AYbgW\YbfYW\hYž'kcXUg'[fc»\Yfnc[`]W\Y'DUUf'Y]bYb'?fUbn'b]YXYf`Y[hY'ibX'X]YBUh]cbU`\mabY'Cbg'<YYaYW\h'[Ygd]Y`h'kifXY"'

## 9a ch]cbU`Y`< Ò\ Ydi b\_hY`XYf`: Y]Yf`]W\\_Y]hYb

'8]Y '9a ch]cbYb 'XYg 'DUUfYg'k UfYb'k À\fYbX 'XYf'j YfgW\]YXYbYb

J YfUbghU`hi b[ Yb 'c \(\final\) ZYbg]W\h`]W\" '6Y] 'Y]bYf 'VYgcbXYfYb 'NYfYa cb]Y

Yf\_UbbhYb 'g]Y \(\final\) XUgg']\fY '`Ub[ '\hat{A}\f][ Y '5a hgnY]h'g]W\ 'XYa '9bXY

ni bY][ h\(\final\) k Ug'ni 'Y]bYa '\Yfn`]W\Yb\(\final\) UVYf'Ui W\ 'a Y`UbW\c`]gW\Yb

A ca Ybh'\(\final\) A ch]cbYb 'XYg'DUUfYg'k UfYb 'Yk Y[ YbXYb'5i [ YbV`]\(\final\) nY][ h\(\final\) k ]Y 'h]YZXYf'5VgW\]YX'X]Y 'VY]XYb 'VYf\(\final\) \(\final\) h'''

'6Y[`Y]hYh'j cb'dfca ]bYbhYb'DYfgÒb`]W\\_Y]hYbž'XUfi bhYf'XYf
6Øf[Yfa Y]ghYf'j cb'9gW\ž'7\f]gh]Ub'K Y]gž'gck ]Y'XYf'DfÀg]XYbh'XYf
5V[YcfXbYhYb\_Ua a Yfž'7`Ui XY'K ]gY`Yfž'i bX'A ]b]ghYf'; Ycf[Yg
A ]gW\cž'bU\a 'XUg'[fc»\Yfnc[`]W\Y'DUUf'Ub'Y]bYa 'j ]Y`ZÀ`h][Yb
Dfc[fUa a 'hY]`"'8Uni '[Y\ÒfhYb'Y]bY'DfcnYgg]cb'ni a 'FUh\Ui g'a ]h
Ghcddg'VY]'j YfgW\]YXYbYb'; fi ddYb'i bX'X]Y'HY]`bU\a Y'Ub'Y]bYf
Hi fbUi ZZO\fi b['j cb'?]bXYfb'Y]bYf'\$! [YbXVYk Y[i b[''

## HfUX]h]cbY``Y': Ygh`]WX\_Y]hYb'i bX'5i g\_`Ub[']b XYf'<Ui dhghUXh

'9]b'<Ò\Ydib\_h'k Uf'XYf'5i Zhf]hh'XYg'; fc»\Yfnc[dUUfYg'Ui Z'XYf 9\fYbhf]VØbY'k À\fYbX'XYg'I a ni [g'XYf'JYfY]bY'''<]YfVY]'k i fXY Ui W\'; fc»\Yfnc['<Ybf]']b'XUg'9\fYbVi W\'XYg'FUh\Ui gYg Y]b[YhfU[Ybž'[YZc`[h'jcb'Y]bYa '5i Zhf]hh'Ui Z'XYa '6U`\_cb'XYg FUh\Ui gYgž'k c'X]Y'6Yj Ò`\_Yfi b['VY[fØ» h'k i fXY'''Ni a '5VgW\`i gg XYg'HU[Yg'YbhnØbXYhYb'X]Y'DZUXZ]bXYf'XUg'hfUX]h]cbY``Y : fYi XYbZYi Yf'''

'8Yf'5i ZYbh\U`h']b'9gW\'XUi YfhY'Yhk U'nk Y]'Ghi bXYbž'k À\fYbX'X]Y
: Y]Yf`]W\\_Y]hYb'Ua '5VYbX']b'XYf'<Ui dhghUXh'a ]h'Y]bYa '[ fc»Yb
I a ni [ ž'Y]bYa ': UW\_Y`ni [ 'i bX'Y]bYa 'VYY]bXfi W\_YbXYb</pre>

: Yi Yfk Yf\_'Zcfh[ YgYhnh'k i fXYb"'8]YgY'\Rightarrow V]\Ai a gZY]Yf\]WW\_Y]hYb ghY\`hYb'Y]bYb'5VgWW]YX'j c\`Yf'9f]bbYfi b[ Yb'i bX'8Ub\_VUf\_Y]h XUfz'X]Y'XUg'J c\\_'Ub']\f'[ fc\\*\Yfnc[\`]WW\g'DUUf'\UhhY"'

"K ]Y";  $U"U"VYf]WA hYhž"[]b[Yb"X]Y": Y]Yf"]WA_Y]hYb"ØVYf"XfY]"HU[Yž k cVY]"YXY"J YfUbghU`hi b[ "XUfUi Z"UVn]Y`hYž"X]Y"`Ub[ <math>A^{\dagger}$  f][Y"HfYi Y i bX"XYb"i bYfa  $A^{\dagger}$  bYfa  $A^{\dagger}$  bYfa  $A^{\dagger}$  bYfnc[hi a 'ni 'k  $A^{\dagger}$  f][Yb"""

'5i W.'< ]ghc ]fYg'F cmU'Yg'\YVh'X]Y'VYk Y[YbXYb'A ca YbhY\Yfj cfž'X]Y'X]YgYb'VYgcbXYfYb'5b'Ugg'dfÀ[hYb"'J ca 'Ya ch]cbU'Yb?fUbn'b]YXYf'Y[Yb'V]g'\]b'ni 'XYb'ZYgh`]W\Yb'I a nØ[Yb'k Uf'YXYg8YhU]'Xi fW\Xfi b[Yb'j cb'Y]bYa '; YZØ\`'XYg'Ni gUa a Yb\U'hgnk ]gW\Yb'XYa '<cZ'i bX'XYa 'Jc`\_"'

8 YhU]`g	
Cfh	9gWX`Ub`XYf`5`nYhhYž@lYaVif[
EiY``Yb	• k k k "[ U`U"XY
	<ul><li>\]ghc]fYgfcmU`Yg"Zf</li></ul>

6 Ygi W Yb 'G]Y 'i bg 'Ui Z 'a Y]b!k ]Yb "b Yh