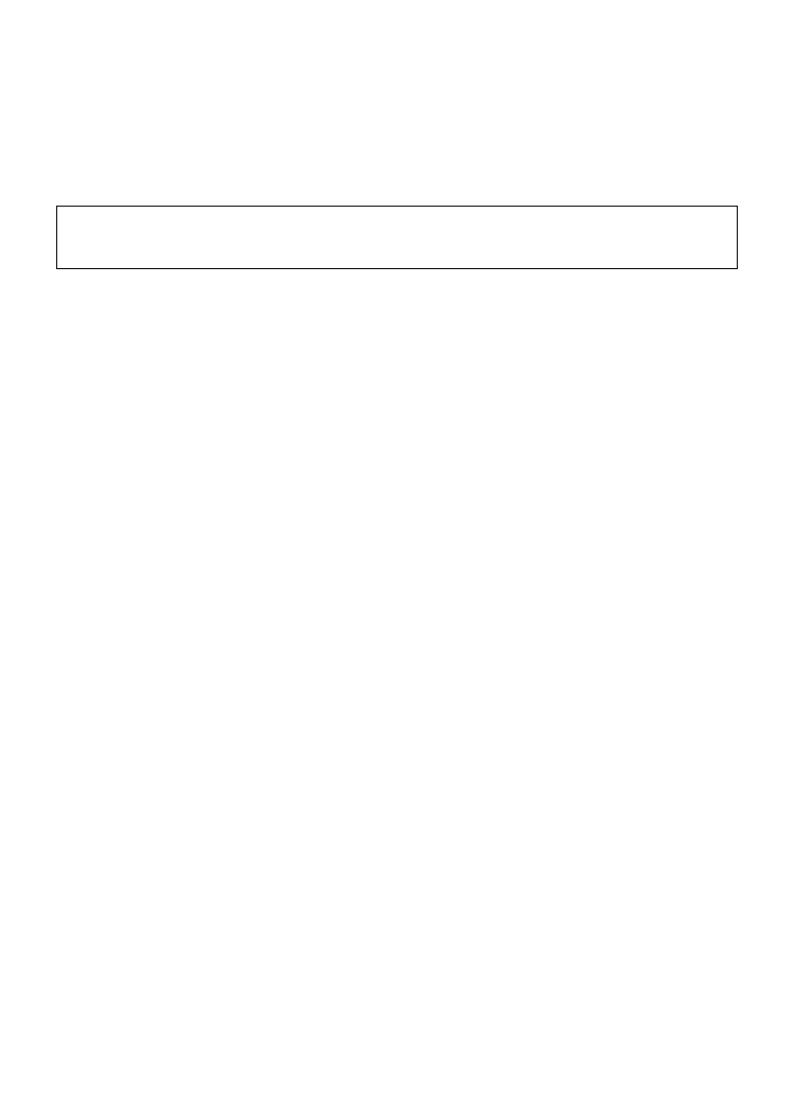


# **ARTS1691**

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Mci 'k ]``YI Ua ]bY`\ck 'WcbhYa dcfUfm`]b[i]ghg`UXXfYgg`]ggi Yg`cZ`Ub[iU[Y`igY"'Mci 'k]``YI d`cfY`hcd]Wg gi WX`Ug`h\Y`bUhifY`cZ\ia Ub`Wca a ib]WUh]cbžh\Y`]bZi YbWY`cZgcWJU``Uhjhi XYg`cb``Ub[iU[Yž]fghUbX gYWcbX``Ub[iU[Y`UWei]g]h]cb`UbX`XYj Y`cda Ybhžh\Y`\]ghcf]WU``XYj Y`cda YbhcZ`Ub[iU[Ygž'UbX``Ub[iU[Y ib]j YfgU`g`UbX``Ub[iU[Y'mdc`c[m'iMci 'k]```U`gc`YId`cfY`fY[]cbU``UbX`g]hiUh]cb']b``Ub[iU[Y'' Mci 'k]```\Uj Y`h\Y`cddcfhib]mhc`k cf\_'k]h\`UbX`UbU`mgY`fYU```]b[i]gh]WXUhU''

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%" 9I d`U]b 'h\Y`gc\\]U``UbX`fY[]cbU``X]a Ybg]cbg`cZ`Ub[i U[Y`j Uf]Uh]cb"

&" 91 d`U]b h\Y a U]b df]bW]d`Yg cZ`Ub[i U[Y W\Ub[Y"

' " 9 I d`U]b 'h\Y`a U]b 'df]bW]d`Yg`cZZ]fghUbX`gYWbbX``Ub[ i U[ Y`UWei ]g]h]cb 'UbX`XYj Y`cda Ybh' ( " 5 bU`mgY``]b[ i ]gh]WXUhU`UbX`Uf[ i Y`h\Y`a Yf]hg`cZh\Y`UbU`mg]g"

### HYUW ]b[ 'GhfUhY[]Yg'

#### FUhlcbU`Y.

 $\label{eq:hamiltonian} $$HY'WcifgY'dfcj]XYg'dUfficZUb']bffcXiWf]cb'hc'[YbYfU'']b[i]gh]Wgz'ZcWig]b['cb''Ub[iU[Y']b']hg'WcbhYIficZigY'''$ 

#### HYUW ]b[ Ghf UhY[]Yg.

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**8YHJ]`g**. `Gc`j ]b[ '@]b[ i ]gh]Wg`dfcV`Ya `Yl YfW]gYg`UbX`g\cfhdUfU[ fUd\ `fYgdcbgYg"`Ghi XYbhg`fYWY]j Y`k f]hhYb ZYYXVUW\_"`H\]g`]g`h\Y`Z]bU``UggYgga YbhZcf`UhhYbXUbWY`di fdcgYg"

#### Gi Va ]gg]cb cZ5ggYgga YbhHUg\_g

Gh XYbhg UfY Yl dYWYX hc di hh\Y]f bUa Yg UbX gh XYbhbi a VYfg cb Yj YfmdU[Y cZh\Y]f Ugg][ ba Ybhg"

#### Hi fb]h]b Gi Va ]gg]cb

#mci YbWci bhYf'U'dfcV'Ya k \Yb'UhYa dhJo['hc'gi Va ]hmci f'Ugg][ ba Ybhh\fci [\'Hi fb]h]bž'd'YUgY
hY'Yd\cbY'9| hYfbU'Gi ddcfhcb'-', ) "''' %cf'Ya U]'h\Ya 'cb'<u>Yl hYfbU'hY'hgi ddcfh4 i bgk "YXi "Ui"</u>"'Gi ddcfh
\ci fg'UfY', .\$\$Ua '-'%\$.\$\$da 'cb'k YY\_XUmg'UbX'-.\$\$Ua '-').\$\$da 'cb'k YY\_YbXg'fl \*) 'XUmg'U'mYUft'''#mci
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a i ghfYhJ]b'mci f'h]W\_Yhbi a VYf'Zfca '9| hYfbU''Gi ddcfhfU'cb['k]h\'Ubmch\Yf'fY'Yj UbhXcW'a Ybhgt'hc
]bWi XY'Ug'Yj ]XYbWY'hc'gi ddcfhmci f'Yl hYbg]cb'Udd']WUh]cb'''#mci 'Ya U]''9| hYfbU''Gi ddcfhmci 'k]''
Ui hca UhJWJ'`mfYWY']j Y'U'HJW\_Yhbi a VYfž'Vi h]Zmci 'hY'Yd\cbY'mci 'k]'''bYYX'hc'gdYWJZJWJ'`mUg\_'Zcf'cbY''
Hi fb]h]b'U'gc'dfcj ]XYg'i dXUhYg'cb'h\Y]f'gmghYa 'gfUh' g'cb'Hk]hYf"

; YbYfU`mž'UggYgga YbhitUg\_g'a i ghVY'gi Va ]hhYX'Y`YWfcb]WU``mj ]U'Y]h\Yf'Hi fb]h]b'cf'U'A ccX`Y Ugg][ ba Ybh''=b']bghUbWfg'k \YfY'h\]g']g'bchdcgg]V`Yž']hk ]```VY'ghUhYX'cb'mci f'Wci fgY'g'A ccX`Y'g]hY'k ]h\U`hYfbUh]j Y'gi Va ]gg]cb'XYhU]`g"

#### @UhY 5ggYgga Ybh'DYbU`h]Yg

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- K cf\_'gi Va ]hh'X`%\$`hc`% 'XUmg`UZhYf`h\Y`gh]di `UhYX`XYUX`]bY`k]```VY`UggYggYX`UbX`ZYYXVUW\_dfcj]XYX`Vi h'U`a Uf\_'cZnYfc`k]```VY`fYWcfXYX"`\Zh\Y`k cf\_'k ci `X`\Uj Y`fYWf]j YX`U'dUgg`a Uf\_'Vi h'Zcf h\Y``UhYbYgg`UbX`h\Y`k cf\_']g`U`Wca di `gcfm'Wci fgY`Wca dcbYbh'f\i fX`Y`fYei ]fYa Ybh\ž`U'gh XYbhk]``VY`XYYa YX`hc`\Uj Y`a Yhh\Uh'fYei ]fYa Ybh\
- K cf\_'gi Va ]hhYX`&\$`cf`a cfY`XUmg`UZhYf`h\Y`gh]di `UhYX`XYUX`]bY`k ]```bchVY`UWWdhYX`Zcf UggYgga YbhUbX`k ]```fYWY]j Y`bc`ZYYXVUW\_ža Uf\_'cf`[ fUXY"'=Zh\Y`UggYgga YbhHUg\_']g`U`Wca di `gcfm Wca dcbYbhcZh\Y`Wci fgY`U'ghi XYbhik ]```fYWY]j Y`Ub`l bgUh]gZJWcfmi: U]``fl : Ł`[ fUXY`Ug`U`fYgi `hcZ i bgUh]gZJWcfmidYfZcfa UbWY`]b`Ub`YggYbh]U``Wca dcbYbhcZh\Y`Wci fgY"

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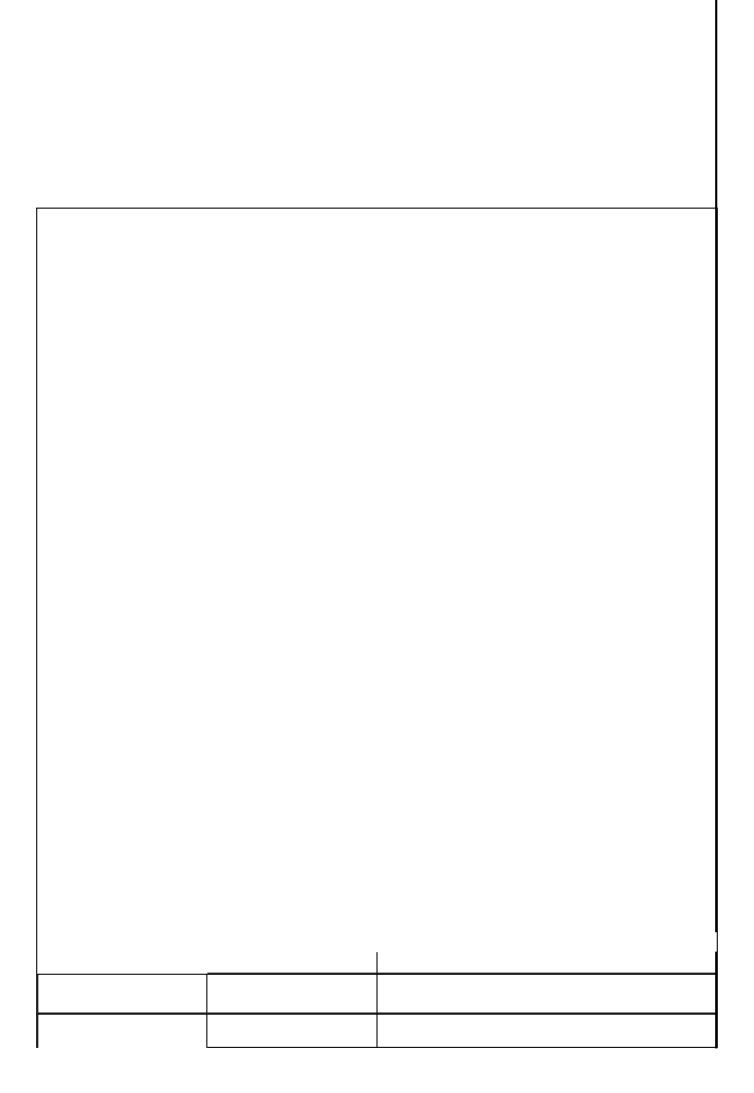
IBGK [fcidgdu[]Uf]ga ]bhch\YZc``ck]b[ WUhY[cf]Yg.

7 cdm]b[.'i g]b['h\Y'gUa Y'cf'j Yfmg]a]`Uf'k cfXg'hc'h\Y'cf][]bU`hYl h'cf']XYU'k]h\ci h'UW\_bck `YX[]b['h\Y gci fW'cf'i g]b['ei chUh]cb'a Uf\_g"'H\]g'U`gc'Udd`]Yg'hc']a U[Ygž'Ufh'UbX'XYg][b'dfcYWhgž'Ug'k Y``'Ug dfYgYbhUh]cbg'k\YfY'gca YcbY'dfYgYbhg'Ubch\Yf'g']XYUg'cf'k cfXg'k]h\ci h'WfYX]h'

⇒ Uddfcdf]UhY 'dUfUd\fUg]b[...7\Ub[]b[ 'U'ZYk 'k cfXg'UbX'd\fUgYg'k \]'Y 'a cghmfYhJ]b]b[ 'h\Y'cf][]bU` ghfi Wh fY 'UbX#cf'dfc[fYgg]cb'cZ]XYUg'cZh\Y'cf][]bU'žUbX']bZcfa Uh]cb'k ]h\ci hUW\_bck `YX[Ya Ybh'H\]g'U`gc Udd`]Yg']b'dfYgYbhUh]cbg'k \YfY'gca YcbY'dUfUd\fUgYg'Ubch\Yf'g']XYUg'cf'k cfXg'k ]h\ci hWfYX]hUbX'hc d]YW]b[ 'hc[Yh\Yf'ei chYg'UbX'dUfUd\fUgYg']bhc'U'bYk 'k \c`Yžk]h\ci hUddfcdf]UhY'fYZYfYbW]b[ "

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