45

DYdUfh a Ybh cZ Afh

Cc"Y[Y cZ Afhg UbX SW]YbWYg

FUW i hm

5 Ufcb @YY 6 Ybgcb (1--*). Dfc Z/ggcf c Z 5 fhUbX 8 YdUfha Ybh7\Uf. 6.:.5., 6.G, UbX A .:.5., I blj Yfglmc ZHVbb YggYY Uh? bcl j]``Y.

>cbUh\Ub;]``Yhh\(200*). 5 gglgd\LbhDfcZ\(ggcf\) cZ5 fh 6.G, I\b]cb I\b]j\Yfglm\(A\thermodela\th

@cf| BYU (200*). 5 gggltbhDfcZ/ggcf cZ5 fh 6.5., I b]cb I b]j Yfglm/A.:.5., I b]j YfglmcZ; Ycf[]U

Ciff]Wi`ia

H\Y8 YdU'ha YbhcZ5 fhdfcj |XYgUb Ybj |fcba YbhUbXWff]W'i a XYj chYXhc XYj Ycd]b[g_]``g glja i `Ujb[W]ltjW\h\]b_]b[, UbX Yl dfYgg]b[WMU'jj |lmk |lh\]b h\YZfUa Yk cf_ cZU7\f]gljUb `]VYfU Uflgdfc[fUa. =b h\YZfYg\a Ub mYUf Uflgdi XYblg VY[]b UZci f-Wi fgY j |g U Zci bXUljcbg gYei YbW]b XfUk]b[UbX XYg][b. Gh XYblg Wa d`YhY UZci f-Wi fgY Ufh\]grcfmgYei YbW UbX di fgi Y j |gi U ghi X]Yg]b cbYcZgYj YfU UfYUgcZWbWbHfUljcb. Ghi XYblga UmUgc

W UXA

 $W \qquad W \qquad k \ | a \quad a \quad Q \qquad A \ | b \quad W[\quad] lk \quad B \qquad k \ | \P \quad f] lf \quad f \qquad Q \qquad Zf \qquad k \quad B \\ Uf \ | gg V \ cf_. \rightarrow b \quad UXX] \ | h \quad Y[\quad U \ Yf \ mdf \ Yg Y \ b \ U \ M \] V] \ | h \quad Zg i \quad XY \ b h k \quad cf_ \ UX \ | f UX \ UY \ Y \ cf \ di \ fg \quad Yk \ cf_ \ | b \ Uj \quad Uj \ Yh \ mc Z \ Uf \ Mg \ W \ Ug X][\ | h \ | a \ i \ gY \ a \ [\quad U \ Yf \ mg \ U \ g \ d \ chc[\ f \ U \ mh \ MW] b[\ , \ cf \ k \ YV \ dU \ YXYg][\ b.$

Gi XYblg XYglf]b[Wrbg|XYfU]cb Zcf lfUbgZvf gli X]c WYX]h UXj UbWX d`UWa Ybh XYdUfha YbhgWc`Ufg\]dg UbX k cf_g\]dga i ghgi Va]hUdcfhZc`]c Zcf fYj]Yk Vmh\YUfhZW\`hm5k UfXgUYVUgYX cb h\]gfYj]Yk UbX ci hglUbX]b[

 $dYfZcfa\ UbW]b\ UfhWi\ fgYk\ cf_.$

= A U cf]b 5fh 49 ci fg

- 5. 7cfYZcf U`5fha Ucfg 31\ci fg
 - 1. 5FH113, 11(, 11*, 11+, 120, 1-,
 - 2 5FH313 31(, 31), 31,
 - 3 5FH3-,, (--
- 6. 7\ccgYUgi VgYhcZh\Y3 WbWblfUljcbg 8fUk]b[/DU]bh]b[/7YfUa]Wg/CMV`dhi fY/UbX; fUd\]W8 Yg[b/D\chc[fUd\mi 12\ci fg 5dd`]Wh]cb cZUWri fgY]b h\Ych\Yf gi VgYhcZh\YWbWhblfUljcb]g U`ck YX k]h\XYdUfha YbhU Uddfcj U.
- 7. 7\ccgYUgYWbXUfmgA

A

\cj

7. 5 dd`|WWYdcfhcbgcZh\YDfU |g=

8.: cf UXX|h|cbU |bZcfa U|cb, gYYh\Y5 gg|gHbh8 YUb Zcf HMWYf 9Xi WH|cb UbX5 WMYX|hLH|cb.

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117. 8 fUk |b| = (3)

DfYfYei |g|hY. 5 FH 11*.

CVYMIj YUX gi VYMIj YfYdfYgYbHJeb cZhY\i a Ub Ú[i fYlhfei [\ j Uf]ei glfUX]HebU UbX beblfUX]HebU XfUk -]b[a YX]U G]l ghi X]c \ci fg/k YY_.

120 =blfcXi Wicb lc 8 | | | | | | | | | a U | | b | (3)

5b | blfcXi Wijcb lc l\ YWYUlj Ydch\bliU UbXUld`|Wuljcb cZWa di l\f. [YbYfU\fXUf\ 5dd`]YX | bgfi Wijcb Wa V|bYX k ||h h YcfYr|Wr Wrbg|XYfUr|cbg[i ||XYghi XYbhghc UVUg|Wr bXYfg|LbX|b[cZh YWra di hYf UgUWMUr|j Ya YX|i a . G|l ghi X]c \ci fg/k YY_.

198 J lei U 5 flæ GYa lbUf = =blfcXi Wicb (1)

=blfcXi Wijcb hc 5 fha U'cf Ya d\Ugyg dfc[fUa UbXXYdUfha YbhYl dYWUljcbg]bhYfbUljcbU gli Xmcddcfhi b]lijYg UbX k cf_dfYgYbHLHcb/WWga Ubg\]d.

$2167.7 \text{ YfUa } \text{ W}_{5} = (3)$

7fYUH; YYI dfYggleb |b h\YWfUa |WUHg UbX h\YXY; Yeda YbheZZefa |b h\Yd`UgHWa YX|i a cZWUmG|l ghi X|e \ci fg/k YY_.

218 8 fUk |b| = (3)

DfYfYei lglhY. 5 FH 11+.

5 Xj UbWX gli XmcZXfUk |b| Ya d\Ug|n|b| h\YXYj Ycda YbhcZdYfgcbU Yl dfYgglcb UbX Will WV UbUnglg Gl gli Xlc \ci fg/k YY_.

220 GHJbYX; 'Ugg(3)

5 VLg/WblfcXi Which he h\YWddYf Ze]`a Yh\cxcZgHJbYX[`Leg H\YWhhb[, [fen]b[, [f]bX]b[, Úhhb[, Ze]`]b[, UbX gc`XYf]b[cZgtU]bYX[`Uggk]`` VYYI d`cfYX.

221.; $fUd \setminus VB Yg = (3)$

DfYfYei lglhY. 5FH 113cf WybgYbhcZh\Y lbgffi Whcf. Gll ghi Xlc \ci fgdYfk YY.

5 gli XmcZl\YhWblei Yg dfUMlWg UbX\|glrfmcZl\Y; fUd\|W8 Yg| b ÚYX 5 lhMblicb k |``VY | ji Yb lc VUglWWb-Widlg UbX hWblei Yg |bj c`j YX |b h\ Y dfYdUUlcb cZUfhZcf Wa a YfWU fYdfcXi Whcb UbX h\ Yi gY cZh\ Y Wa di hYf UgUXYg[b hcc`.

231. D\chc[fUd\m=(3)

DfYfYei |g|hY. 7Ua YfUk |h\ a Ubi U`mUX'i gHVYUdYfhi fYUbXg\i hhYf gdYYX.

=blfcXi Wijcb lo dfcWggYgUbXUgh\YhW j Ui YgcZVUWUbXk \ |hYd\chc| fUd\m|bW X|b| VUgl\WWa YfUUbXXUf fcca hYWb]ei Yg WobhYbh UbXWa dcglhjcb, UbXUb]blfcXi Whjcb hc Yl dfYgglj YUbXXcWa YbHJfmk cf_gUdd`]WWY hc UfhUbX^ci fbU]ga . Cli XYbhZ fb]g\YgÚa UbXXUf_fcca gi dd`]YgZcf dfc^YMg CJl gli XJc \ci fg/k YY_.

232 $D \cdot chc [fUd \cdot m = (3)]$

DfYfYei |g|hY. 5 FH 231.

5 Woblibi jb[Yi d'cfUljcb cZd\chc[fUd\mk]h\ Ya d\Ugig cb WiYUlj Y Yi dfYgglcb UbX j]gi U Yi dYf]a YbHLljcb. Gjl ghi X|c \ci fg/k YY_.

242 Df|bha U |b| = (3)

DfYfYei |g|YY. 5 FH 11* cf 11+. G|| gli X|c \ci fgdYf k YY_.

5 b]blfcXi VAjcb lc df]bljb[]b l\ YdfcWggYgcZ]blU `]c, fY]YZ, UbXd`Ubc[fUd\]W

311-2 DUbhb[==(3)

DfYfYei lglhY. 5 FH 11*.

HUX||hcbU dfUM;|WgUbXUddfcUWYghcghi X|cc|`/UMin`|WlUbh|b[.9a d\UglgcbWbh]bi YXj |gi U XYj Ycda YbhUbX h\Yi gYcZWcf. Gll ghi Xlc \ci fg/k YY.

DfYfYei lglhy. 5 FH 21+.

7cbhbi YXk cf_ |b WfUa |Wg gfYgg|b| Vch\ Wbgfi Wilcb hYWblei Yg UbXXYg[|b df|bVkl] Yg 5 gli XmcZ[`Uh|b| UbX Úf]b[h\text{h\text{W}b]ei Yg G]l ghi X]c \ci fg/ k YY_.

323 GW/dlifY=(3)

DfYfYei |g|hY. 5FH11*.

5b |blfcXi WicfmWri fgY lic lh,Y j Uf|ci g dfcWggYg licc`g UbX hYWb]ei Yg lh,UhUY i gYX |b WYUl|b[3-X]a YbglcbU gW'dhifY. GlighiX]c \cifg/k YY_.

324 GW/dh fY=(3) DfYfYei]glhY. 5FH11*. $A~cXY]b[~UbXWg]b[~]b~j~Uf]ci~ga~UMf]Ug~G]l~gli~X]c~\ci~fg/k~YY_.$

333 GW/dh fY=@]ZYA cXY]b[(3) DfYfYei]glhY.5fh32(.

499 GYa]bUf \rightleftharpoons Dcfl78c`]c UbX; fUXi Ul]b[91\]V]h(2)

DfYfYei]gllY.7cbgYbhcZh\Y8YdUfhaYbh/5FH1-,,3,..

TYUW\Yf L]WYbgifY

325 5fh|b h Y9 Ya Ybl Ifn GWcc g(3)

5 Wri fgYXYg[[bYXZcf h\YYYa YbhLfmhYUWYf XYj Ycd]b[Ufhg_]``gXfUk bZfca ghi Xmi b]hg]bUfhUddfYVJUhcb. Bc VbYX]hhck UfXUaUcf]bUfh

357. =bglfi WijcbU 8 Ygl[bJ \rightleftharpoons =blYl fU]b[5fh]blc 7 Uggfcca =bglfi Wijcb (2)

8 Yg[b UbX]a d`Ya YbH.Hjcb cZ]bgffi Whjcb k]h. UHMbHjcb hc WffYbh]ggi Yg dfcV`Ya g UbX dfUMjWg]b h.YÚYX,]b-Wi X]b[]bHM fUHc Q bUh lh b[W fUH c [fUMV c f

i Kf-AQ 1 cWMLa] 1

i E cgUR

i E cgur

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Yf