

# 15019455

*by Fahad Chohan*

---

**Submission date:** 19-Nov-2015 11:16PM (UTC+0000)

**Submission ID:** 48812127

**File name:** 15019455\_2145417\_827330025.ipynb (138.6K)

**Word count:** 2741

**Character count:** 135849

```
{  
  
  "cells": [  
  
    {  
  
      "cell_type": "markdown",  
  
      "metadata": {},  
  
      "source": [  
  
        "#Longer computing task\n",  
  
        "####Student ID : 15019455\n",  
  
        "####Last updated : 19/11/2015"  
  
      ]  
  
    },  
  
    {  
  
      "cell_type": "markdown",  
    }]
```

```
    "metadata": {},  
  
    "source": [  
  
        "##Introduction"  
  
    ]  
  
},  
  
{  
  
    "cell_type": "markdown",  
  
    "metadata": {},  
  
    "source": [  
  
        "In this experiment a cathode ray tube was used to accelerate a beam of electron  
through a voltage  $V$ . The electron beam was then bent into a circular path with  
radius  $r$ . The radius of the beam was measured by two students by using a ruler.\n",  
    ]  
}
```

"However for two of the measurements one student making measurements was distracted by a Seagull flying past the window and so a larger uncertainty was given to these two measurements. For this reason I am calculating weighted and unweighted values for  $\frac{e}{m}$ ."

]

},

{

  "cell\_type": "markdown",

  "metadata": {},

  "source": [

    "In this notebook I am going to calculate values for the charge of an electron divided by its mass,  $\frac{e}{m}$ , from the gradients of my weighted and unweighted graphs produced by the two students' results."

]

},

{

"cell\_type": "markdown",

"metadata": {},

"source": [

"These equations for energy in \$eV\$ of an electron, circular motion and the force on  
the electrons in a magnetic field will be used:\n",

"\n",

"\$\$ \frac{1}{2}mv^2 = eV \$\$\n",

"\n",

"\$\$ F\_r = evB = \frac{mv^2}{r} \$\$\n"

]

},

{

"cell\_type": "markdown",

"metadata": {},

"source": [

"By using these two equations we can form a linear relationship between  $\sqrt{V}$  and  $r$ . By using the following equation:  
\n",

"\n",

" $r = \sqrt{\frac{2m}{B^2e}}\sqrt{V}$ \n",

"\n",

"By using this equation we can plot  $r$  against  $\sqrt{V}$ . This should give a straight line graph and the gradient of the graph would be equal to  $\sqrt{\frac{2m}{B^2e}}$ ."

]

},

{

"cell\_type": "markdown",

"metadata": {},

"source": [

"We can rearrange this to give the following equation which will be used to determine the values for  $\frac{e}{m}$  ( $g$  is the slope of either graph):\n",

"\n",

"\$\$ \frac{e}{m} = \frac{2}{g^2 + 2B^2} \$\$"

]

},

{

"cell\_type": "code",

```
"execution_count": 1,  
  
"metadata": {  
  
    "collapsed": false  
  
},  
  
"outputs": [],  
  
"source": [  
  
    "import numpy as np\n",  
  
    "#I have imported numpy so that its functions can be used\n",  
  
    "\n",  
  
    "import matplotlib.pyplot as plt\n",  
  
    "#I have imported matplotlib so that I can use this module to plot graphs\n",  
  
    "\n",  
  
    "%matplotlib inline\n",
```

```
"#I have used this command to tell matplotlib to plot the graphs in line with the
notebook\n",
"\n",
"from IPython.display import display, Math, Latex"
]
},
{
"cell_type": "markdown",
"metadata": {},
"source": [
"#####Data import"
]
},
}
```



```
    "[ 0.00169  0.00179  0.0075  0.0075  0.00205  0.002115  0.00219\n",
     " 0.00225 ]\n"
]

},
],
"source": [
    "Vdata, Rdata, Rerror = np.loadtxt(\"eovermda.csv\", unpack=True, delimiter = ',')
\n",
    "#I have unpacked and imported the students' data from the .csv file and have
assigned values\n",
    "\n",
    "print Vdata\n",
    "print Rdata\n",
```

```
"print Rerror\n",  
  
"##I have printed the arrays made from the table just for reference to calculations"  
  
]  
  
},  
  
{  
  
"cell_type": "markdown",  
  
"metadata": {},  
  
"source": [  
  
"#####Assigning values"  
  
]  
  
},  
  
{  
  
"cell_type": "markdown",
```

```
    "metadata": {},  
  
    "source": [  
  
        "Here I have assigned values which will be used later on in the calculations for  
        certain quantities."  
  
    ],  
  
},  
  
{  
  
    "cell_type": "code",  
  
    "execution_count": 3,  
  
    "metadata": {  
  
        "collapsed": false  
  
    },  
  
    "outputs": []  

```

```
"source": [  
  
    "xdata = np.sqrt(Vdata)\n",  
  
    "#x-axis data points to be used on graphs\n",  
  
    "\n",  
  
    "ydata = Rdata\n",  
  
    "#y-axis data points to be used on graphs\n",  
  
    "\n",  
  
    "yerror = Rerror\n",  
  
    "#Error in y points\n",  
  
    "\n",  
  
    "w = yerror**(-2)\n",  
  
    "#A value which will be used in the calculation of the weighted slope and intercept  
and hence the corresponding value for e/m\n",
```

```
"\n",  
  
"n = 8.0\n",  
  
"#This is the number of data points\n",  
  
"#This will be used in calculations\n",  
  
"#Printed as a float so that when used a float format result is outputted and not  
integer or other type\n",  
  
"\n",  
  
"mean_x = np.mean(xdata)\n",  
  
"mean_y = np.mean(ydata)\n",  
  
"#Mean values of x and y data points to be used in calculations\n",  
  
"\n",  
  
"B = 1.28 * 10**(-3)\n",  
  
"B_error = 0.01 * 10**(-3)\n",
```

```
"#The value and error for the magnetic field (in Tesla) used in students' experiment"
```

```
]
```

```
}
```

```
{
```

```
"cell_type": "markdown",
```

```
"metadata": {},
```

```
"source": [
```

```
    "##Graphs"
```

```
]
```

```
,
```

```
{
```

```
"cell_type": "markdown",
```

```
"metadata": {},
```

```
"source": [  
  
    "I have plotted below the unweighted, weighted and combined graphs respectively."  
  
]  
  
},  
  
{  
  
    "cell_type": "markdown",  
  
    "metadata": {},  
  
    "source": [  
  
        "####Unweighted graph equations"  
  
    ]  
  
},  
  
{  
  
    "cell_type": "markdown",
```

```
"metadata": {},  
  
"source": [  
  
    "This is my unweighted graph. I have used the following equations."  
  
]  
  
},  
  
{  
  
    "cell_type": "markdown",  
  
    "metadata": {},  
  
    "source": [  
  
        "To calculate unweighted gradient,  $g_{\{1\}} = \frac{\sum(x_i - \bar{x})y_i}{\sum(x_i - \bar{x})^2}$ ",  
  
        "\n",  
  
        " $\$ g_{\{1\}} = \frac{\sum(x_i - \bar{x})y_i}{\sum(x_i - \bar{x})^2} \$\$$ ",  
  
    ]  
}
```

```
},  
  
{  
  
"cell_type": "markdown",  
  
"metadata": {},  
  
"source": [  
  
    "To calculate uncertainty in gradient,  $\Delta g_{\{1\}}$ :  
    "\n",  
  
    " $\Delta g_{\{1\}} \approx \sqrt{\frac{\sum d_i^2}{(n-2)} \sum (x_i - \bar{x})^2}$ "  
  
,  
  
]  
  
},  
  
{  
  
"cell_type": "markdown",  
  
"metadata": {},
```

```
"source": [  
  
    "To calculate intercept, $c_{1}$$:\n",  
  
    "\n",  
  
    "$$ c_{1} = \\bar{y} - g_{1} \\bar{x} $$"  
]
```

```
},
```

```
{
```

```
    "cell_type": "markdown",
```

```
    "metadata": {},
```

```
    "source": [
```

```
        "To calculate uncertainty in intercept, $\\Delta{c_{1}}$$:\n",
```

```
        "\n",
```

```
    """ \Delta{c_1} \approx \sqrt{\left(\frac{1}{n} + \frac{\sum (x_i - \bar{x})^2}{\sum d_i^2}\right) (n-2)} $$

]

},
{
"cell_type": "markdown",
"metadata": {},
"source": [
"#####Unweighted graph"
]
},
{
"cell_type": "code",
```

```
    "execution_count": 4,  
  
    "metadata": {  
  
        "collapsed": false  
  
    },  
  
    "outputs": [  
  
        {  
  
            "data": {  
  
                "image/png":  
  
                    "iVBORw0KGgoAAAANSUhEUgAABIoAAAEjCAYAAABdOup0AAAABHNCSVQICAgIf  
                    AhkiAAAAAIwSFIZlnAAALEgAACxIB0t1+/AAAIABJREFUeJzs3XecFdX5x/HPI2BH15L  
                    YFYwaiQ2jQZREwRYFRCPqz4qYlnxBarFtaGiqiLBXuviYYYYNfaCWKluKrFG7KAxggW  
                    7shZQUXI+f5xzYXa4u3fu7t29u3e/79drX3Bn\ nzpx5zsxZdM495xlzd0RERERERER  
                    BYqdwAiiiiiiii2aKBIREREREREREQADRSJiiiiii\ niEikgSIREREREREREQE0UCQili  
                    iiiiipEGikREREREREREBNAUYsws6Fm9ni54yiWmU03s23K\ nHudLa+12mtl1ZnZa/  
    ]  
]
```

PtvzGxqa527ucxsHzN7oNxxtDYzO8jMPjKzL81smRLWW2tmfyhVfSlilili\nlqWmgalmio  
MNs83sq8TPRSWsv5uZzTWz1rxHHn8qRnKQJqG12znvfO7+uLuv24rnbhZ3v8Hdf9vc\n  
nemJfXrMUMWU4V7N+d8ysC3Ausl27L+XuM0sY3ry+0F4HIEVEREREpLJ1LncA7Zg  
DA939kRY+jzW4\ nw6yTu//YwueXhGZc8wbvYweS+RqUqG839ZqvCCwKTGnm+UVE  
RERERNodzShqBWa2rpk9ZGafmdiU\nM9s9sW8xMzs3zlCqM7PHzGxR4LFYpC4uf+k  
dZyBMMMrPzzOxTYJSZLWVmfzOzj2MdI83MYt1DzewJ\nMxtrZp+b2VtmtkOBcHuZ2aux  
/F/MbJFErAPN7AUzmxnj2CCx7zgzezPG+qqZ7ZLYI4x7Ziy3hZkd\nYGbvxCU+Qxq5fr  
VmdoaZPW1mX5jZncnlQGZ2i5l9EK/fRDP7Rdz+J2Bv4Jg44+uuRLUbm9mL8Zib\nku1  
MnTvfNV/TzB4xs0/N7BMz+7uZLZ04ZmMzez5ei5slgw65fX3N7N3E53ozbVLL1JY3s3v  
jNfss\n9o28gx9mdmG8ll+Y2XNm9uvEvsXM7Pp4T18zs2NSMRS6d48nP81s2Fm9ka  
M65LEvrXi9a+L1+XG\nuD3XI1+M92Fe/y9wnRvr22ZmJ8btH8X2LRWrS/7ufGVmm+U  
53yJmdoGZzYg/55vZwma2DvMHiOrM\n7F95jp1gZoektr2Yu26xbz8br8MzZrZ5njrWBa  
4ANo8xfh63DzCzyfE+vmNmo1LHDTGzI2Pfy7V\nnm8Q1yd3LT83sZivhsjkREREREek  
YNFDUPAVnLJjZE sBDwN+BnwB7ApeZWY9Y5BxgY2BzYFngGGAu\n8Ju4f+m4/OW  
p+LkX8D/gp8AY4BKgK9Ad2AoYAhyQCKEXMBVYDjgbuLZAe/YGtgd+BqwDnBjbsXE

8\n9sAY55XA3RaW6QC8Cfza3ZcCRgN/N7MVUnG8GI+9Efgn8Mt4nn2BS8xs8UZi2y  
+2ayXgByC5zG88\nsBbh+j4P3ADg7IfFv5/l7I3dfedEO3cHfku4bhsCQxs5d/qaG1ATY+  
kBrAacEq/TwsCdwPXAMsAt\nnwGCyL3VLLos7GngXWD6e+3h3b6ieZ4CN4jn/AdwSY  
wEYBawe27od4Xon6yl079IGAJsSrtseZrZ9\nn3H4acL+7VwGrABcDuPuWcf+G8T7c0k  
C9xfTtA4D9gb7AmsCSsTzU/93p6u5P5znXyHi+jeJPL+BE\nnd38DWc9x/LZ5jv0HsFfug  
4WBydWB8Wa2LKE/XkDo6+fF7fUGbNx9KjAMeDLGuGzc9TWwr7svTbjO\nnB5nZzonz  
XBrPvRKwNLAY8+/l4cAgYMu4f2YsLylilikpkGiprOgDvjrlrcT74ktQOBae5+vbvP\nndfcX  
gNuB3S3kUDkAGO7uH8T9T7n7HBoehHrf3S9197nA98D/EQYQZrn724TcKvslyr/t7tfG  
AYa\nASuZ2U8bqNuBS9x9RszLUsP8B+l/AVe6+7Me/A34jjDAhbvf6u4fxr//E/gvkJzJkb  
sGThgkWhk4\n1d2/d/eHgDmEwZ6G4vqbu7/m7rOBkwgDFBbPd11s//eEgY6NzKxr4vj0  
tXTgInf/MLbzHqBnA+eG\nxDV392/d/X/u/nCM/VPgfMJABkBvoLO7X+juP7r7bcCzjdTd  
mDmEB/5usa5JDRWMuYRmxhjPAxYB\nfh537w6Mcfcv3H0GcCGJa5Lh3qWd6e5fuu  
7wKPMv3ZzgG5mtoq7z3H3fxfZ3mL69j7Aue4+3d1n\nnAccDe8bfqSxLzvYm9L9P4z0cn  
ai70PF3Aj3NbLVELLfF/jcAeD3ej7nufhNhoHZQnnoWOI+7T3T3\nnV+PfXwZuYn7f2g24  
293/Hc91MvUH/IYRBvreT/wu7Gatm+dMRERERETaOT1ANJ0DO7v7MomffLN1\nn1gA

2Sw4oER5SVyDM8lmUMIsiq3cTf18e6AK8ndj2DmE2R86H8wIOgywQZl9kqf8dwoBOr  
h1Hp9qx\nKmEgI7ckZnJi3/qE9uV8IPj7NzGeT1LbiomrC7C8mXUyszPjcpsvgGmxzPK  
N1AWJ61LkuTGzFSws\nV3svnnMc89u6MjAjdfzbFCc3gDCWMNvnQTP7n5kd2+ABZi  
MsLCuri9d/aeZfg5VTbXgvdWyhe5eW\nnvHazCbN+IMyGM+AZM3vFzA5Y4MjGFdO3V  
8qzrzPh9yqLifMcv3IDZetx968ls4Zyg6h7EmexxTre\nnSR3ydt a6zWwzM3s0Lrerlwz+JPv  
WvHvn7t8AnyUO7wbckbiPrxFm32W9JilililhooagXvABNT\nnA0pd3f0QwkPet+SfSdPQ  
EqPk9k8JMy+6JbatTmogoEirp/6eG/R4B6hJtWNJd7/ZzNYArgIOAZZ1\nn92WAVyhtAu  
d0XN8T2r83YbbGNnG5TvdYJnfuLEu+CpVJ7x8D/AisH8+5H/N/lz6g/kAdhEG2hswG\nkkvuVs qdz92/dvcR7v4zQhuPMrOt0xWY2W+AamB3d6+K1/8L5I+DDwjL43JWSxxbsnv  
n7h+5+5/c\nfRXCAMd\nVtybzorp2+/n2fcDYUAyyz3Pd/z7RcR6I7BXzD+0qLs/GrfPYMH  
7vQYLDh7SQJz/IMxY\nnWjUu4buC+ffifcLgLBByT1F/QO8dYIfU7+ji7v5BEe0SEREREZ  
EOTgNFzZPIYXo8sI6Z7WtmXeLP\nnr8xs3bjE5i/AeWa2Upwdx3nMLfMJIVfRzxqq2MNb  
of4J1JjZkvGh/0hCPqSmtucQM1sI5loZCdwc\nn910N/NnMesWkuUvExLtLAksQHno/BR  
aKM0nWb2IMDcW1r5n1iHmMTgVuicvYliQsgfs85oMakzr2\nnI0lOm0L1F2NJYBbwpZmt  
QhikyXkS+MHMD o/3elfgV43U9QKwT7z3OxDyy4SgQvLwteISuy8Jg1P5\nn3gTWITBI8

qmFhMwnA0sl9v8TON7MqmK8hzJ/kKK5927etTOz3c0sN5BRF+udGz9/RCN9OS1D3

74R\nONLMusU+OAa4Kf5OFFzdicefaCFh+PKEZVzjssYH3EcYABpNWB6W3L6Ome1I

Zp3N7P+AdYF789Tx\nEbBqIs8XhL41093nmFkvwkBozm3ATol/I06hft+9AhbjZqsDmNI

PzCzfkcjREREREZEGaaCoee6x\n8Mai3M9tcfu8hMRxmcr2hOUpMwizO84AcomGRw

AvE/LYfBb3W\nwmVgNMsvC2qs2S9SYcRhi0eAt4\nnnLAE5q/pOBlam23h8fgHCcvh/gu

cHtvxH0li60uAz+O+IXHfa4T8MU8SliWtDzyRqreYOPLFNQ64\njnD9FiYk7oWQd+Itwr

V9JcaQrPta4BdxOc7tjdTf2Ayu9L7RhETcXxDyG93G/Ps9B9iVkBz7M2CP\nuD9dZ85w

YCdC4uG9gTsS+9YiJEL/Cvg3cKm7T8wT4/3x5w1gOmEpXXL506mEmTjTCPf2Fkl+o

abc\nu3z3MbdtU+ApM/sKuAs43N2nx32nANfH+7BbnjYU27f/Qu gTj8X9s2N5Ur87M+O

AS9rpwHPAS/Hn\nubitoXbWDzbc59uBbQizgHLbPyfkJTuaMPg2A hgYt6c9DLwKfGhm

H8dtBwOnmtmXhFxcuYFaYu6i\nwwgDU+8T+sXHhIFSCLmn7iYsVfyScE/ztV1ERERE

RKRB5g2+RKkFTxpmTlwAdAKucfez8pS5CNiR\n8AA41N0nJ/Z1ljzYvefuO8VtvQiDGF

0lsysOdvemJhGWNsTMHgXGuftyh1LJTCzg4A93L1fuWOR\nposzqWYCa8V k3yliliils

3W6jOK4iDPJcAOwC8leT56pMr0Jzz8rE1429blqWqGE xK1Jke5zgZO\nncveNCctlzm6Z

FkiZIDLfUYdiZiu aWR8zW8jMfg4cRf2ZS9JOmNIOZrZ4XGZ5DvCSBoI ERERERKSU\n

yrH0rBfwZnyt9feEZRQ7p8oMAq4HcPengSozWwEg5kDpD1xD/cGDDwhvegKoIn/yW  
Gm/Wn/qW+VY\nmJC/5kvCcqc7gcvKGpE01SDCv20zCDmY9ixvOClililiUmk6l+Gcq7D  
gq7o3y1BmFULy1/MJyYOX\nSh1zHPCEmZ1DGADbvIQxSxipiVTzuPs7wAbljkOaz90  
PJOQKExERERERaRHImFGUdWZleqmRmdlA\n4OOYryi9/1pC8tzVCW9HUj4bERER  
EREREZEiiGNG0QxgtcTn1Qgzhhors2rcNhgYFHAMYLQosZWZ\nnc/chQC933zaWv5W  
wNG0BZqYITCLiTxDuyhUmlilillhyjGj6DlgbTPrZmYLA/9HeKVz0t3EV6+b\nWW+gzt0/  
dPcT3H01d+9OyM3xSBwkAnjTzLaKf9+a8KrwvNy9Yn9GjRpV9hjUNrVP7au8HxERER  
ER\n6RhafUaRu/9gZocCDwCdgGvdfYqZDYv7r3T3+8ysv5m9CcwCDmiousTf/wRcam  
aLAN/Ezx3O9OnT\nyx1Ci6nktoHa195VevtERERERKRjKMfSM9x9AjAhte3K1OdDC9  
QxEZiY+PwcCybFFhERERERERGR\njMqx9Exa0NChQ8sdQoup5LaB2tfeVXr7RERE  
RESKY7COInvCzLyjtVIEpLnMDFcyaERERGRiqcZ\nRRWmtra23CG0mEpuG6h97V2I  
t09ERERERDoGDRSJilililiAigpWcilmKBIp6JililiHQMmlEk\nlilililiKABooqTiXnSankto  
Ha195VevtERERERKRj0ECRilililiAylEkliZKEeRili\niEjHoBIFIiLSujkzyx2Bilili0Eg  
0UVZhKzpNSyW0Dta+9q8j21dXBkUfCBhuUOxIREREREWkl\nGigSEZH6fwRrrwS1I  
0XZs+G558vd0QiIIIiZtbFzPY0s4lmtk2545G2x8yWNrMVzWxVM1vDzLrF\nnnxXKHZtlkv

pqy1GOlhERma+2Fo44ApZeGi64ADbeGFCO IhGRUjGztYBhwAbAl8DnwCzgHGBtYB  
t3\nH9WC5x8MjAA2A3q6+0uJfb8HxgBruvsFjp/D2Bld3+4Jeovlpn1B/YEpgDrAQ+4+7  
hSHVuojJI1\nAQ4DVgXWAFYGLnL3GxNIFgX+CPwU6Ax sBlx398vyxLQu cAFwurs/U  
WzMznYKcHIDTb7a3YflqbMX\ncLK7Dyw2niz1mNk+wPbA24RrdLu731VsPRnP1Qk4  
GNgYmAE48Fd3n9ZY7IWY2R6Au/stzaynSf21\nFH01S5ks/bmlczV6L7L2VT P bDdg c+  
BZYHnjB3S9voXaVpK9m7Yel+P1qSOcshUREpMJNmwbV1fDc\nc3DOOTB4MJjGhU  
RESsXMOgNnAlOBo4Bjct9emtmSwJXA74ABL RmHu99mZl0Jg0EvpXZ/SHjAapFB\no  
uhswkNU2QeKzGwL4HpgbXevM7MlgKlmNsvdb2/usRnrHwWMc/fX4zEDgbvNbHl3vzi  
WGQP8Gujj\n7t+b2abAM2bW1d3PShw3mDD4uH08pintXQHYh/BQPZfwgNoZOB6ozl  
Pn4sA4wsNs cnvBeDLWMxw4\nEljP3WfFctPM7GN3fzJrPUWUuQqoc/ffx7lvA+sCezQ  
WfwaLNfP4JvfXUvXVUvXnIt pR6F4U7Ktx\nAGgFdz86cT0uMbNh7n5lidtVyr7aaNtL9fv  
VGC09qzAVmSclquS2gdrX3rXb9n39NZx4lmy6KfTs\nCV OmwG67aZBIRKSE4oyQB4  
AdgF+5+53JK e7u/jVwDW Fm0cRW CGk74NH0Rne/z91PaqmTmtlCQB/g\nnkZY6R5FG  
AXe4ex2Au88C/gFkuQZZjm20TBywO5rwcEkscy/wHHBKop6FCDMhcl/yvxb/3DJ5nLsf  
\nAJzXzJg/dvcb3f0Od7/L3e8mzLAY4e5f5qmzGvgfUO9/HDLG02g98eH2VGBCjJU4iP

kYiWuWJZ4s\nZeJs+2pPyA2AbgzYxtaWIP7a7P7apYyRfTngufKeC+y9NU/AE+lrselw  
E6lbFcp+2qWtpfi96sQ\nDRSJiHREc+fC3/8e8hBNnw4vvhgGjBZr9hdeliKyoL8CvYCd3  
P2zBsq8B9zl7nNbMhAzM2AbyjOj\nZyNgacLDU1mZ2SJAP+CV1K5XgI3MbLnmHJux/  
rnAB0DXVJm3gGXMXC7CcA7n6Eu6/p7t/E/T+Pf07K\nF15TY46fz0kd1xtY3N0XGMA0s+  
2AF4GP8p2zsXgy1vMLwrX5OLX9PWC7OPBYVDwFyhxDWNI373fQ\n3Y9x938UakN  
La2p/LVVfLVV/LqidWe5Flr46B7gg97sUbQxMjseU6ve0IH21mH7YnN+vRmnpWYXp\n  
27dvuUNoMZXcNID72rt21b5nnoHhw+GHH+Cf/4Qtih3RCliFcvMBgD/B4x29+mNFH2  
LsCQtd9wl\noDuvGuHb7V8DmwD/zi2jMLOlgNHA14T/r38NONbd10/U05Xwrfcs0Es8z  
09JDLSZ2S6EnElbAPu4\n++eJfYsSvo1elvAQtbpwvLt/YWaHE77Bn0P4Vv6PhleqXsB  
t7n5zrGNXwrK6jYBPgPPN7Et3PyTL\nNWwh3QnXLD1L5svE/oYG9blc+3WhMu7+HL  
BmnvrXluSuauj8xwL3k3pQLiBT939q9yOuFxyNLBz\nujlzWwbYyt1PjP2nSQu812uW  
Gp7F8KA4+rA9KzxNFYmDghsCjxgZn8GliMMY1092ub2r7kKQhL\no5qqqf21JH01S5  
mM/XmdQvWEsezC9yJjXz0XqCUsJTsGeIMwUJ7LtVXw+mRs14q5UFJiuqrpe6H\nnzfk  
91UCRiEhH8cEHcPzx8OCDMGYMDBkCC2liqYhICzuCMHhyeWOF3P1H4sOJma1P  
GJS5mZDP52N3\n/6OZPUTly5HLa/QwcKO7nx3PUoiB0Us8y/g5ISZt939rfh5JUK+ot

PM7E3gN8BdcV9XwhK1m9z9\nyLhtV6CfmU0IPCRdDLxEeKgf6e7fmdnOwF9i/MQ8H

7eb2Z2EB57DmnQIS2vZ+Oes1Pav458NzijK\neOzCTanfzDYkzHg4Mj27zMwOBn4GL

AlMcfc5jcTYIJjTDiTcr2/z7DuGANIRMmqsnlcIMzJWSm3P\hDYQuT3z4zhhPY2W6Ex7y

BwK/dfdP4iyQV81sEc+TOLwhZvZ3Fryeq8R9e6a2f+ru+2Wotqn9tVR9\ntST92cyytqPY

e5G3r7r7c2a2l3APcDVhVs127v5DLNKk65qnXa9Smr5asn6Y4VyN0hNChWm3eVly\n

qOS2gdrX3rXp9n37Lzx5JmywAay4IkydCkOHapBIRKSFxW+5+wEvuvvHqX1dzex6M

7vfzF4ws2fN\n7KK4exngDsIMotnAcAB3387d941IaoBFcwNA0SzqL+uqISzFSJb5hvrLz

rYH/mrhbWSrA8mkq+cC\hXd39nBjzSsAgQs6PzYDxQE/CgNFp7p6bAZJbrpFsbydgK5

qYgyleqwkJf/6Wocrcg+KPqe25B+LG\nvIDPcmzR9ccHwouBW939ovR+d78sziY7B/hv

XFKSVVHxxFiOAh7ME+dgwluhvkpsLnq2TKF6Yh6v\ng4EdckuSLCQe7pJsS5Z4MpTJ

/U/R6+7+STz/XMJA62gzW5iM3H1fd98x+UP4XTonvT3jIBE0vb+W\lnqq+Wqj9nqaeoel

Ggry4D/BnYnzBgsizwrJkNKiKegu2K8ZWir5asHzb397QsM4rMbAfCa9w6Add4\hzNafK

nMRsCPhP45D3X1yYI8nQvKo99x9p8T2wwg36EfCur5jW7QhliJtmTvceSeMGBEGiZ5

6CtZa\h9xRiYh0JMsT/sf/zfSO+D/v+5vZWoTIEKe5+6i473EAM+sHPJFLjppjZlWEpRO

nJbZ1JswGOqtA\hmV8zf9kF7n593HcScG9uQMvMlgaGALVxyUYX4CvgqLg0LXdcp+

Ahd/8iEWI/wnKPpE1oRn4id9+/\nKcc1ljdwI/7WJJJeHpK6Zxzal/jMJfeFPjZwbd59kZq8B  
N5rZ6p7tLXXFxtOXMHvp1eTGOFj4C3c/\nLVW+qLdgZK3H3e81sw+BajObSZhI9CTQ  
m/BGqYL1ZDzXp/HPt1JI6ggDn+sDz2dqXMOa86aQpvbX\nUvXVUvXnLPUUey/6kr+v  
GmHAfVTMW3SXmd1A+Lfrr2a2SgnbVZK+Son6YSI+T1t9oCgO8lwCbEuY\nGvusmd3  
t7IMSZfoDa7n72ma2GWGqbu9ENcMJa7C7Jo7pR/iGY0MPPr41MJqzqMNpVnpQiVXLb  
QO1r\n79pc+15+GY44Aj76CK68ErbdttwRiYh0RJ8SlmR1aqRMr/hnvpk2/YAb8mzfgvC  
Nd3Jm0KaEJUIP\nFyizJKm3jll6LofMDSxeZ14/FnuvsAb0lxzvvS10JOo4GEpSBJWxO  
+JU8ney2X9wlfSK+Q2p5b\navJGM4/9opj6zewl4Ct3PyZ+Xh34kDAD4j+EQbxhiUPeBj  
YnJNF9rpFYi4k5aXtgt9PoJ3TH+hh\nZn9NbOsHLBy33e3ud2SIJ3M9MUfMvDaa2f7A  
sx5eZT64UD2Ea9hYmbuAewmz7QrNzCmXpvbXUvXV\nUvXnLPHUUdy9aKiv9gCW9  
kRya3efYmbbAtMI+dVeLkW7cstAm9IXS9kPm/17Wo4ZRb2ANz0m8zOz\nnmwhJp6Yky  
gwifkh7k+bWZWZreDuH5nZqoSG15Bl+AccBJzh7t/H4z5p8ZaliLQ1n30GJ58Mt9wC\no0bBsGHQWenoRETKwd1/MLNbgB3NbNEGcr3sRFimVe9hP37puR55XmMPLBr/TH6  
D3g94xt3nmNIx\nwOt5ymwNvBr/n/rYxKz+XQgJqSdYyEE0mTB7CMLbfuoxs3XdfaZr  
QF0S8W4C/A94dv7XYGX3P3N\nneO6J8fiFgWp3r8nTtrzM7HpCEu4sPnH3IY0ViNfpIcJ

AS9ImwOTGniWyHpu1fjPbG5ib+vb/z8DJ\nhDavxPxcKjkrEK7z9AYb2YSYU9u/Sm3D

Q0LdekI1LeS9cg+v684kaz1mdiHQz903jJ8XJixhPKLl\neLkc60FgjVSoKxGSFb9KGT

W1v5ayr5agP5/k7j9mPFcx9yJvXyX8u7p4eqO7f2Im7wAzirmuBX5P\nS9ZXS9EPS/F7

Wo4EFasA7yY+vxe3ZS1zPuHNC+IXh64NbGlmt5lZrZltWrqQ2482nSelmsq5baD2\nt

Xdlb9/338PFF0OPHiH30JQpcMghGiQSESm/lwn/gz/OzJblbbTgT4QH/jfcPf3Wnb6EnE

P5Zos8\nCXxLnF1vZhsRlkFMibODFmugzIGE2fxdCDOLcvoQImgA/Mrdp7n7VMKA0Q

aJmLuY2YnAqnHT1sAH\n7p781n0L4FbCN9+bxUEiCG8Fyr2Cejjw9zztapC7758nv0tD

P40OEiVcCexu4e1xmNnywK7AqYk2\n72hmN8RZCEUdm7H+3xKux2Jmdlz8OR7o6S

Hh7svAA6lj1iAsITzP3T+lvtzzXb5ZbFlizlmRMHiY\nRWcanoDQWDxZ6unK/FlyEGJ9wt

1vbGI8jZU5jZCoPZdjZhICkpQTPSSbb47mLDvLaWp/LUIfzXj+\nxvrzj1nrobh7kbevxn/D

3jCzem9XNL PfERJff1i duVm+ZSqrxbT9ub+fjVauLVITaCU/mUyMxtl\neOvDZDPrm9rf

GVjG3Xub2a+Af5L/NXYilpXloYfCMrOVVoJHHoH11y98jliltAp3/8zMNiG8feZh\nM3uXs

CTtB+A+woyiE/Mc2o3wtrH0I6O4+wdxScOZZvZfwIKN3xGSHI8Fznb3D/OU2ZnwpetY4

MJE\nITcBxxNm7F+V2D4YOMvM1ovxLgxc7+7/i/vXZMGlcQ3VdTqwT5wp9aC7v53ver

Umd7/fQv6lq83s\nRWAj4HB3vytVdIEHrCzHFioTHwRvJcx6+FXqnHfGOtzM9gBOiA+y

Trjuh7j7NbnCZtYHOJzwJiYH\nrjezp4Eb3D1XV9b2Qlias0DfS4oP3H8mpAhxM3sAuML  
d78gST5Z6CL8bp1jIX7s0Ycld+s1hWeop\nWMbdn4+/M1fHSerAMe5+7jGrkOeOG5i  
wbdIrt37Zva/om7752l3qb211L01SxIsTnls5VzL1o\nrK/uRvjGUcYsF+ckMLmyFK3i  
xL11SxtL+HvV4PMvegE9c1iZr2BU9x9h/j5eMIUruTa5iuAWne/\nKX6eSvhW5XDC+ukf  
CFNulwJuc/chZjYBONPjGkQLr/fczN0/S53f999/f7p16wZAVVUVPXv2nJdf\nJDcrQJ/1  
WZ/1uc1/vuEGuOwy+n74IZx3HrVLLQVmJam/traW6667DoBu3boxevRo3L0U34aJili\\  
niEgbVo6Bos6ENdPbEJJZPQP5Qsmsz7U3fvHgaUL3L13qp6tgBEe33pmZsOAld19IJ  
mtA/zL3VfP\\nc35v7TaLiJTUI1/C6afDX/4C1dVhNtEii7ToKc1MA0Uiililh1Aq+coimv4Di  
WstX0NuNID9vFh\\ncbAHd78PeCvOCrqS8Mr7vNUI/v4XYE0zexm4kfA6zw4hNyOgElV  
y20Dta+9apX1z54bBoZ//HD79\\nNLzZ7NhjW3yQSEREREREOo6yZDI19wnAhNS2K1  
OfDy1Qx0QSrxH18Laz/UoYpohI2zFpEgwfDgs\\nDHffDb9KL5EWERERERFpvlZfeIzu  
Wnomlu3Ku++GWUOPPw5nnQV77QXW+ivAtPRMRERERKRjaPW\\nZylksEDty3mA  
AAgAEIEQVTs2TB6NPTsCWutBVOnwt57I2WQSEREREREOg4NFFWYSs4DU8ltA7  
Wv\\nvStZ+9zh5puhRw947TV4/nk49VRYYonS1C8i\\liltKlsuQoEhGRPJ5/PuQh+vprGD  
cOttyy3BGJ\\nililiEgHoxxFliLI9tFHcOKJcM89cNpp8PvfQ6dO5Y6qHuUoEhERERHpGL

T0TESkXObMgXPOgfXX\nh6WWCnmlDjywzQ0SiYililhlx6GBogpTyXlgKrltoPa1d0W1  
zx3uvTcMENXWwhNPwLnnQlVVS4Un\nlililiKSiQaKRERa05QpsOOOMGIEXHgh3Hs  
v4998k7q6unrF6urqGD9+fJmCFBERERGRjko5ikRE\nWsPMmeF19zfcACNHwiGHQJ  
cuQBgUGjlyJDU1NVRVVS3wuS1QjlIRERERkY5BM4pERFrSjz/CFVfA\nnuuvCt9+GV9  
4fccS8QSKAqqoqampqGDlyJNOnT29zg0QilililtJxaKCowlRyHphKbhuofe1d3vY9\nn+ij8  
8pdw003wwANhwOgnP8I7fFVVFdXV1XTv3p3q6moNEomliliSFlooEhEpNSmTYPBg8  
Nr7k86\nKQwY9ezZ6CF1dXWMHTuWadOmMXbs2AVyFomlililiLQG5SgSESmVr7+G  
M84IM4eOOir8LLZYwcOU\no0hERERERNoKDRSJiDTX3LkhSfXxx0O/fnDmmbDKKp  
kPHz9+PH369Kk3KFRXV8ekSZMYMGBAS0Rc\nNA0UiYililh0DFp6VmEqOQ9MJbcN  
1L526+mnYYstqK2pgVtugXHjhokAhgwYMACM4eqqqrazCCR\nilililh0HJ3LHYCISLv0  
/vthBtG//gVjxsBqq8Hmm5c7KhERERERkWbR0jMRkWJ8+y2cfz6cey4c\nneCCccAJ07V  
ruqFqclp6JililiHQMmlEKlpKFO9xxB4wYARttFJac/exn5Y5KRERERESkpJSjqMJU\nnbB  
4YKrttoPa1aS+9BNtsA6NGwdVXhwGj1CBRu26filililhIVJaBljPbwcyymmtl/zezYBspcFP  
e\nnaGYbp/Z1MrPJZnZPnuOONrO5ZrZsS8Uvlh3Ep5/CwQfDttvCbrvB5MIhwEhERER  
ERKRCtXqOljPr\nBLwObAvMAJ4F9nL3KYky/YFD3b2/mW0GXOjuvRP7jwl2Abq6+6D

E9tWAq4GfA5u4++d5zq8cRSLS\nuO+/h8svh9NOg732g\lNOgWU79tizchSJililiHQHM5Z  
hR1At4092nu/v3wE3Azqkdg4DrAdz9aaDK\nzFYAMLN\gf7ANUD6oeU84JgWjF1EKt0  
DD4QcRPfeC7W1cNFFHX6QSEREREREOo5yDBStAryb+Pxe\n3Ja1zPIANTA3eYCZ  
7Qy85+4vITTadqaS86RUcttA7Su7//4XdtoJDjkEzjwzDBitt17mw9t8+0RE\nRERERDlox  
0BR1nVf6dICZmYDgY/dfXJyv5ktDpwAjGrkeBGRBX3xBVRXw+abw5ZbwquvwqBBYP  
on\nREREREREOp7OZTjnDGC1xOfVCDGGiuza\w2GBgUcxgtCixlZn8Dzga6AS9ae  
LhbFfiPmfV94/T\nAQwdOpRu3boBUFVVRC+ePenbty8wf1ZAe/2c29ZW4inl5759+7ap  
eNS+dt6+H3+k9rjjmHPFFWy1\nyy4s8sor1E6dCk8+Sc+ePZk0aRJLLFE+21fMz/X1tZ  
y3XXXAcz791JERERERCpfOZJZdyYks94G\nneB94hsaTWfcGLkgms45ItgJGuPtOec4x  
DSWzFpGGPPEEDB8Oiy7KV6efznG33kpNTQ1VVVXU1dUx\ncuTleZ8IUDJrEREREZ  
GOodWXnnr7D8ChwAPAa8DN7j7FzlaZ2bBY5j7gLTN7E7gSOLih6orcXvFy\nnMwlqUS  
W3DdS+VvHOO7DnnrD33jBiBDzxBF379aOmponRI0cyfr0Jg8StYn2iYililiINFM5lp7h\  
n7hOACaltV6Y+H1qgjonAxAb2rdncGEWkgsyeDWefDRdfDIcdBtdeC3FZGYQlqNXV1  
XTv3p1p06Zp\nJpGliliHRYrb70rNy09Eyka3GHm2+GY46BLbaAs86CNdZYoFhuuVI1  
dTVjx47Vsrm8tPRMRERE\nRKJ0ECRiFSm/\wn5CGaPRsuvBB+85u8xdI5iZsjKD8NF

ImlilidAytnqNIWIYI50mp5LaB2lcylnH30Ef/wjDBgAQ4fCs882OEgEMGnSpHqDQIVVV  
dTU1DBp0qSiTlp909ERERERDoGDRSJSGX47jsYlnOxbWWW+qquD118OAUadOjR  
42YMCABWYOVVVVMWDAgJaMVkREREREpE3S0jMRad/c4d574aijYN11ln4dxzYZ1  
1yh1VxdHSMxERERGRjqEsbz0TESmJ116DI48Mr72/+GLYYYdyRyQilililtKuaelZhank\\  
nPCmV3DZQ+4oyc2ZIVL3VVtC/P7z0UtkHiSr9/omlililISMeggSIRaT9++AEuvzwsMZsz  
J8woGj4c\\nunQpd2QilililiVQTmKRKR9eOQRooIWG45uOAC2GijckfUoShHkYililhlx  
6AcRSLStr31FowYlnAZMnwznnwK67gmm8QkREREREpCVo6VmFqeQ8KZXcNID7F  
vDVV3DCCfCrX8Emm4RIZoMHt9IBokq\\nfylilili0jFoRpGIc1z58Lf/w7HHw/bbBMSVa+  
ySrmjEhEREWnTzGxpYDHCM14nIPft2jfu/lHZ\\nAmtHdA0rj+5p0yhHkYi0HU89FZJTA1  
x4lfTuXd54ZB7IKBIRaR4z2w44ENge6Ao8CLzj7sOKrKcH\\nsLK7P1z6KFteW4zfzPoD  
ewJTgPWAB9x9XCmOK1TGzLYErgH+DXwGLA2sAxzq7i/FMosCfwR+SnjYln3QgY7+  
6XJeo5BTi5gVCvTvYzM1sXuAA43d2fSMXbBTgMWBVYA1gZuMjdb0yUKRhPLLcPob  
+/Heu6\\n3d3vKvL6ZImn1a9hscxsD8Dd/Zam1hHrKWdfzXTfY9nG+liWe1HwnsZyfaxrP  
fUzHYDNge+BZYH\\nXnD3yxs4DjPrBZzs7gOLvT5m1gk4GNgYmAE48Fd3n1ZkmaJiL  
pZmFIII+c2YEWYQPfwnnHEG7Lsv\\nLKSVsSliUjnc/SHgITN7HXjW3XdsYIVnEx6K2sx

AS5HaVPxmtgVwPbC2u9eZ2RLAVDOb5e63N+e4\njHUVBCwB7AJ8T7guf3T3NxKnG  
wP8Gujj7t+b2abAM2bW1d3PimVWAPYhPDTOJTxYdgaOB6pjPAOB\nwcCXhIfrMXm  
aNgoY5+6vJ46528yWd/eLs8ZjZsOBI4H13H2WmS0OTDOzj939ySKuT5Z4Wu0aNsi\\  
nzTy+LfTVLPc9Sx/Lci8K3tMsfYxsvxf9gRXc/ehE3ZeY2TB3vzLP9VwcGEcYwCm2XQ  
BXAXXu/vtY\\n38vAusAeWcsUG3NT6EmswlRynpRKbht00PZ9+y2MGQMbbgirrgpTp8  
KQle1ykKjs75+liDSfma0K\\nrA38q4nHLwT0AR4pZVtpY3GPwq4w93rANx9FvAP4KQ  
SHJeljAPHu3uVu//E3fdMDXBAeGZbnvl\\n8r8W/9wyUeZjd7/R3e9w97vc/W7CrJAR7v5  
IPP+97n4AcF6+BpIZV+BowsM3uWOA54BTssYTH6RP\\nBSbENuPus4HHknUXuj5Fx  
NNq17DMyt1XC17DQn0saz0UuKdF9LEs9/QPwFOpGC8Fdmg/mrgf8xf\\nwpa5XWY2  
mDCAlhx4nADcWUyZJsRctPb3NCYi7Z873HYb9OgB//kPPPtsGDDq2rXckYml\\LSkre  
Of\\njzbx+I0ISzAeK004ra5NxW9miwD9gFdSu14BNjKz5Zp6XJF1N7q0292PcPc13f2bu  
Onn8c9JiWLn\\npGLsDSzu7hPzNaGBU80FPiAsjUx6C1jGzH6SMZ5fxDo+TtXzHrCdm  
S2U8fpkiqdAm8gYMxR3DVt\\nW+irGa/hvFM31JYi6mnsnhbsY/Fzlns6B7gg1Z82Bian  
TxqXEL8ILJDbKG07jiEsR5ubOO4Yd/9H\\nkWUyx9xUWnpWYfr27VvuEFpMJbcNOID  
7XnwRjjgCPvsMrr0Wtt660ePai0q/fyliUhJbE5ZkPADg\\nZocTvt2eQ/hG/4+Eh+NewG3uf

nMstyvwO8JAyyfA+Wb2pbsfkqs45seoBpYIPDytRvhG/gszGwF0\nj9v+QVgesQnw79T  
ShX3ivncJyz7ud/fHM9Q/DNiAMAvgPGB/QtLYdYE/ER5CG42/TLoTnofSs0W+\nTOz/rI  
nHfV1E3euY2TnAV4QZZ/fk7n0DjgXuJ/EQ7O5f5f5uZp2B0cDOjdSxgDgzY808u9YCPif  
\ntcgXz3e5UFLluhAGClcHFqXA9XH354qlp01cw0YY4fejqdpKX01a4Bo2UUP1NHZPs  
/Sx6Rnv6bIA\nLWGp3THAG8A2QL2cVGa2DLCVu59oZrsU26444LYp8ICZ/RlYjjCYNN  
Hdr81appiYm0MDRSLSOj75\nBE4+GW6/HU45hftWWYUtvILqhJF6urqmDRpEgMGD  
ChbmClili2oH/C4u8+1kNT5c+Bi4CXCg89I\nnd//OzHYG/gLcDBBzhNxuZncSHhgOS1Y  
al+g8Ctzk7kfGbbsC/czsTcLgzM2E3EAfu/sfzewhQv4O\nzMyAa4HFgb1jfI8QBrEeL1D/  
M4RVCmMI3+Z/4+7HxDJXAGe4+58bi7+Mlo1/zkpt/zr+mXeWRsbj\nFi6i7I8Au7q7x2v9  
ppI95+7JpSaY2cHAz4BFgCHuPqeB+A4kXOdvG9ifmZltSJpcGRyhkOBeF4h\n9IWVUt  
WtH/9cnuKuT5Z42sw1NLO/54I/lbhvz9T2T919vwzVtpW+Wsw1bFSGehq7p69SuI9NT  
+3L\ne0/d/Tkz2xG4B7iaMFtoO3f/lXX8MeTPuZS1Xd0JA1sDgd+6+ydx5tOrZralh6TXW  
coUE3OTaelZ\nhankPCmV3Dao4PZ9/z1ceCG1a60FCy8MU6bAQQexxZZbMnLkSOR  
q6oAwSDRy5Ej69OIT5oCbpmLv\nnn4illISZ/YwwCye37KwXMB7oSrgwOs3dc9+S55bd  
JI/vBGwF5FsGcy7Q1d1z31yvBAwi5LBYBrid\nMINoNjAcwN23c/d94/FHxPJ/TDx8Pw9

cIKH+zWM7esT6T0jE9SVhcKxQ/AWZ2fVmNiHjz98yVpt7\inqPoxtT334NzQI+pZjsta9/P

A/u7htcxxBsRE4PT0Sd39sjgD7Bzgv3EZTD3xoflowlv1miXWdTFw\inq7tfI\N7fUDyxLQc

DO+SWLVIIIltwlHvojTbj2jcTTpq6hu+/r7jsmfwi/Q+ekt2ccJIK20VeBbNcw\niwL1NHpP47

9ThfrYPI3d0zhT6M+EmZBjCINrz5rZoESZwYS3wH2VODTvDLFG2pUbe3nd3T9JtONf

\nwGgzWzhjmUwxN1fZZhSZ2Q6EV+Z1Aq7x+pnAc2UuAnYk/EdnqLtPTuzrRJi2+5677

xS3jSWMvs0h\nJJg6wN2/aOm2iEgD7r8fjwSVI89vO5+6NB5u6qqqqipqWHkyJFUV1c

zduxYampqqKqqarg+ERGR\n9iu31voRAHe/HsDM+gEPpf6ftR9hWUHSJuTJ72NmSw

NDgNq4BKELYanGUe7+OfBh4jxPxOVFyeMX\nBo4jvHo5N4MAdx+Rsf7bYrnfx/qT32h

vwPzlK3njz8rd92/KcQXk8pukvzzP5cSpa8ZxmepOPXjm\nzAZ+YWZVHpMLJ7n7JDN7

DbjRzFb3kMQ3py9hNsOrDcRejDMJS1r+1FihfPG4+71m9iFQbWYzCbOM\nngR6A9N

g3qTyYq593nja+DV MajSPUgFI76tpBa5hZg30n4L3tIE+9m/m97GkvuS5p3E25R3AKA

95\ni+4ysxslb4D7q4UXEFQBv3D301J1FsqLIWzXasCncddbqaJ1hC8H1s9SxswmF4rZ

5+dJarKyzCiK\ngzyXADsQppTtFaffJsv0B9Zy97UJ/xhcnpdmOCGTeHIk70HC6/E2lwj

cnzLtKDtquQ8KZXcNqiw\n9r3xBgwcClcdBmPHwv330zcxSJRTVVVFdXU13bt3p7q6ul

0PEIXU/RMRkZawNfC5u7+Q2l5vUMhC\nLqCBxGVnqeNfd/d08tZ1CN/8n+XuZ7t7jbtF

Adx0ufJl0R7XeAnwEMNxJ21/t8k648DUL9ObGso\n/nJ6n/DwuUJqe26pTfrNWcUcV7C

MmXU1s2lmln5D1FKEZ5zvzWxFM5thZulXXr9NmEXwi9T27YHZ\ nzX1QNLmjgK/c/cC

49Gd1M1u4mHjc/Tl3P87dz3L38YS8Mc/GgZuirn0j8bTZa1hi5e6rxV7DvLLU\ nk+We5jb

k6WNrML+PJTV0T3sAS3siubW7TwG2jR/XA/oDPczsr7kfwr+n68bPv8vQrvUlud++ofH

Z\ nX1nKFlo5070opFxLz3oBb7r7dHf/HriJBZNKDSKMiuHuTwNVZpZbR70q4YZdQ2Ikz

90fSkyXfRpY\ntUVbISL1ffEFjBgBW2wBffvCK6+EASPLP+BeV1fH2LFjmTZtGmPHjp2

3DE1ERKQC9SO17MrM1gC6\ UX8AZxfCg9BdZarma0Vt2+dOz4+II+M23PfvH+QPq

GZrRv//AnhQSXfQFHueeDdPMevk7H+LsBm\ n1J8FtXOs+9IC8WdiLbD0zEPukIdY8M

FqE2BybulHU47LWPdcQh6T11NI1gGejrO/fkrlw7JsqswK\ nhH4yPU/9+WZjZGZmewNz

UzMo/hzjzRSPmV1oZi8I6lyYsPTwQiju2jcSz4+00WtYam2grxZ7DRuS\ npZ4s97RgH8v

TInz3dC4hN1s97v4l8A5h9dK17r63ux+Q+yHM+JkSP9+RpV1x3ONBwmBW0kqEZOG

\ \ nZimTleYZedpZPHdv9R9gN+DqxOd9gYtTZe4Btkh8/hfwy/j3WwhJzLYiZD/Pd457CM

n40tu9kj36\ n6KPIDqHFVHLb3Nt5+374wf3qq91XXNH9D39w//DDBYqk2zdz5kw/+OCD

febMmXk/tzft+v5IEP/t\ nLMt/M/SjH/3op73/EJYUzAUOS20/AJiR2nYRcBnhy9CzEttfAg6

Nf68G1kjs+w+we+JzF+BEYNv4\ neXfCErCF8sS2EDAV2CW17QhgUMb6N4vt2yl+Xo7

wILVflvjLfG92ICy9WSp+Xp6QM2rnRJkdCQnB\nty3yuCxIxgBrJz73lszu2CSxbQKwQe

LzGoTk52fkac/LwNsF2rxmvF/98uz7LeEL92MJSxKPI6zS\huC/utyzxEJKxJ5/3ziS8ya/Y

a99oPOW6hk3oZ0MJOXfac18t5ho21sey9J8s97RgH8tyTwnjBoek\ntv0OuKCRe/E48F

gT2vVLQuLp5eLnZQgDO8OKLFN0zMX+ICtHUdZXA6anIZiZDSS8rWGymfXNe1D4\n

hmKOu/+jGTGKSBaPPQbDh8MSS8C998Imm2Q6bNKKSfVyEuVyFumtZyliUinMrBdh

wOWXhP//3c/M\nNiXk0ZxLeJi6IXXYTYQH4RrgqsT204F94uygB9397cS+wcBZZrYeY

WnCwsD17v6/uL8b4Y1I9RJK\nQ0iUGv//+nQz2yge3yWWn5qx/t8QZhNtaGYbE775P8j

dH8gYf9m4+/0x99LVZvYisBFwuLvflSra\nmcRykCzHZaz7FOCEuHLiO8LMhM3d/cVE

mT1imdzSmzUJD4nX5GnSNFKJ0HPMrA9wOOELdweuN7On\ngRvc/U4LSYFvJcxW+

FXq8Dtjm9zMssRzInCKhZyzSxOW4NR741eh65MInugUWukaZmFmN7HgW8hW\nnivv

2TW3/xN33zlJvG+irBa9hoT6WtR6y3dOCfSyhsXu6WzzXOMKsncUJKW6OTBc0s98R

ZrP1BtzM\nHgCu8DCrqGC73P15M9ufcJ3flbwN7zh3H1dMmWJibiqLo0+tysx6A6e4+w

7x8/GE6YRnJcpAdS6\n+03x81RCEqrDgf0I/5FailBW8TZ3HxLLDSW8+m4bz/M6QzP

z/fffn27dugHh4bRnz57z8ovk3lyk\nz/qswU+v/02tUOHwquv0vfi2GPPaidOLHtxKfPzfp

cW1vLdddB0C3bt0YPXo07t6cJlwillKh\nzOwu4BV3L2o5mYiltE3IGijqTFhzuA0hedYz

wF4ekjDlyvQnTE/tHweWLnD33ql6tgJG+Py3nu1A\nePXgVu7+KXmYmZejzSIVY9YsO

PtsuOQSOPxwqK6GxRdYJisVxsw0UCQilgswMyMsdTnA3e8pdzw\l\ltJ8ZUlm7eG1m

YcCDxCmSN3s7IPMbJiZDYtl7gPeMrM3gSuBgxuqLvH3i4ElgYfMbLKZXdZijWij\ncjMC

KIElw3aQfvc4cYboUeP8FazyZNh1KjMg0Rtvn3NVOnExERacD6hASuz5Q7EBERKY

3MOYrM\nbDFgL2CDeNzihHV+XxESjN2Sb91zQ9x9AiHhU3LblanPhxaoYyKJt0e4+9p

Zzy8iRfjPf0Ieotmz\ln4YYb4De/KXdEliliUmZmthswmvDF7dVmdqK7v1TgMBERaeMyLT

0zs20Jr8sbn0hal9tnwlaEZWPQ\np\xJM\l aeizShA8/hBN\gAkT4PTTYehQ6NSp3FFJ

GWjpmYililhIx1Bw6ZmZLQpMd/eL0oNEMO9d\ln8y+6+3mEBNMi0t59913IQ7T++rDccj

B1KvzhDxokEhERERERqXAFB4rc/Vt3fzPfPjPbMM4oypV9\ntZBSfEqOU9Ke2vb+PH

jqaurq7etrq6O8ePH5y3fJtrnDnffDeutB088AU8+CWPHwtJLN7vqNtG+\lnFITp7RMRER

ERKY6h6GTWZjbEzC6Ir6GfRchbJC\pffr0YeTlkfMGi+rq6hg5ciR9+vQpc2QNePVV\ln+

O1v4bjj4NJLw4DR2kr7JS\lili0pFky\l FU7wCzlcC9QG9gEPCBu49ugdhahHIUSWvKDQ

5VV1cz\nduxYampqqKqqKndY9X3+OZxySnij2UknwUEHQZcu5Y5K2hjIKBIRERER6R

iaMIDUH3jM3b9umZBa\l gakpLVNnz6d7t27M23aNlp161bucOb74Qe46ioYPRoGD4

ZTT4Xll93VNJGaaBIRERERKRjKHrp\ngbADcK+Z3WZmx5pZr1IHJU1XyXIS2mPb6u

rqGDt2LNOmTWPs2LEL5CxKatX2PfwwbLwx3HorPPQQ\nXHZZiw8Stcf7V4xKb5+lilili

HQMTRkoqnX3vsB+wJPApiWNSKRC5Jad1dTU0K1bN2pqaurLCqH\nR6+5hjkDB8KB

B4aZRA8/TN3qqzeYYFtEREREREQ6lqYsPfsd8J67P9sylbUsLT2T1jj+/Hj69OIT\nLyd

RXV0dkyZNYsCAAa0bzFdfwZgxzL3qKu5Ze222uvNOqlZcsd5gVpvLnSRtipaeiYilih0D

E0Z\nKLog/vVhwLfARHe/pNSBtRQNFEmHMncujBsHJ5wA224LZ5xB3eKLt/0E29Lma

KBIRERERKRjaMrS\ns9uAW919J2AI8FRpQ5LmqOQ8KZXcNmiB9j35JPTuDZdfDrffD

tdfDyuvTFVVFdXV1XTv3p3q6upW\nGyTS/RMREREREWn7Cg4UmdkiZjYvy627P+7u

T8S/f+PuzyXKrt4yYYplZjNmwH77wW67wWGhb//\nDZttNm93MQm2RUREREREpG

PJtPTMzAYCSwF3uPs3efYvA+wOTHH3x0seZQlp6ZIUrG++gXPPhfPP\nh4MOguOOg

yWXrFcknZNIOYokKy09ExERERHpGDLnDKzlYADgJ8CiwJdgB+B2cB7wNXu/kULx

Vky\nGiiSiuMOt90G1dWwySYwdx07563aJtKsC3tigaKREREREQ6hqKTWbd3IT5QVF

tbS9++fcasdRouo\n5LZBE9v3wgtwxBHw+edw4YXQr1+LxFYKun/tmwaKREREREQ6hq

YksxaRcvvkExg2DH77W9hzT3j+\n+TY9SCQiililiLtg2YUibQnc+bApZfCmDGw775w8s

mwzDLljko6AM0oEhERERHpGDqXOwARyWjC\nBDjySOjWDR57Dhr0KHdElililiUm

GKWnpmZnuY2VLx7yeZ2R1m9suWCU2aora2twhJhKbhs0\n0r7XX4cBA2D48PBWs

wkT2uUgUYe9fyilililu1lsTmKTnL3L83s18A2wLXA5cWe1Mx2MLOpZvZf\nMzu2gTIXx  
f0vmtnGqX2dzGyymd2T2LasmT1kZm+Y2YNmpnd9S/tWVwdHHw19+sDWW8Mrr4QB  
I9Pql\nHxEREREREWkZReUoMrMX3L2nmZ0JvOzuN5jZZHffuODB8+voBLwObAvMA  
J4F9nL3KYky/YFD3b2/\n\nmW0GXOjuvRP7jwl2Abq6+6C47WzgU3c/Ow4+LePux+U5v  
3IUSdv2449w7bUh/9BOO8Hpp8MKK5Q7\nKungIKNIRERERKRjKHZG0Qwzuwr4P+A  
+M1u0CXX0At509+nu/j1wE7Bzqswg4HoAd38aqDKzFQDM\nbFWgP3ANYPmOiX/uU  
mRcluU3cSJssgmMGwf33QdXX61BlhEREREREWk1xQ7y7A7cD2zv7jOBZYDq\nlutY  
BXg38fm9uC1rmfPjOeemjlnB3T+Kf/8I6JPB15WcJ6WS28bbb1Pbty8MGQInnBCSVf+y  
stJ\nVfT9o/LbJylililiHUOxbz3LDQptYPPzpDjwYBF1ZF33IV7iYGY2EPjY3SebWd8GT  
+DuZqb1ZdL2\nzZoFZ50VXnk/aFCYRbT44uWOSkRERERERDqoYgeKZjF/oGcxYCD  
wWpF1zABWS3xejTBjqLEyq8Zt\ng4FBMYfRosBSZvY3dx8CfGRmK7r7h2a2EvBxQw  
EMHTqUbt26AVBVVUXPnj3p27cvMH9WQHv9nNvW\nVulp5ee+ffu2qXia9XmrreDGG  
6kdPhw23JC+L7xA39VWazvx6f51+PbV1tZy3XXXAcz791JERERE\nRCpfUcmsFzjYb  
BHgQXffqohjOhOSWW8DvA88Q+PJuHsDFySTWccyWwEj3H2n+Pls4DN3P8vMjgOq\nnll3z0UYAACASURBVMxa2qTnnguvuv/2W7jwQvj1r8sdkUhBSmYtliiltxFJuKG0JFs

wv1Ch3\n/wE4FHiAMBvpZnefYmbDzGxYLHMf8JaZvQlcCRzcUHWJv58JbGdmbwBbx  
88dTm5GQCVq92378EP4\n/e/Dm8z+8Ad49tl6g0Ttvn0FqH0iililiJtX1FLz8zs5cTHhYC  
fAqcWe1J3nwBMSG27MvX50AJ1\nTAQmJj5/DmxbbCwiLe677+CCC2Ds2DBQ9Prrs  
NRS5Y5KREREREREZAFFLT0zs26Jjz8AH8VX3Lcb\nWnomrcYd7r4bjj4a1lsPzjkH1I6  
73FGJNImWnomlilildAzNyIHUhmmgSFrFK6/AkUfC++/D+efD\n9tuXOyKRZtFAkYilihl  
x5ApR5GZTYp/fv3/7d15mJV1+fjx9y2EoqgTuWRZoaVmIkAqWrhg6lcU\nc+IrmS0ulWn  
+3Epxl0szBMHzdCUxtOWLfNNMEzVTR22+iksiJCCioLkEulyiolLcvz/OYRqGGZjl\nnzJy  
ZM+/XdT1X8zzn83nOfZ+D0zX39fncT0QsaHC81b4hqiUquU9Kl8jt9dfh2GPhK18pPO5  
+8uRm\nF4m6RH5tYH6SJEmS1Pk1q1CUmYOL/9snM9ducNhsRVqyBC67DD77WVi6  
FKZNKxSMPvShckcmSZIk\nSVKzNWvrWUScWPyx0cGZeUEpg2pPbj1Tyf3tb3DCCb  
Dhh0Wm1V/4QrkjkkOrWeSJEIS99Dcp56t\nTaFltAWwHXArEMBXgUntE5rUyc2aBSe  
dBFOnwvnnw377Qfh3tCRJKiSp62ru1rMzM/Ms4BPAFzPz\nnxMz8CfBF4FPtGaBappL7  
pHSa3BYsgFNPhR12KBxPPQX779/mIGnya+dmJ8kSZIkX7NKhTVswGw\nnuN754ul  
1qfltXQrjxsEWW8C//w1TphQKRmusUe7IJEmSJEkqiWb1KKobHDECOAi4mcLWs/2B  
GzPz\nnPYJr/TsUVRZbr/9dgYPHkxVVVXtdraWmpqahg2bFjp3uj//g+OPx569oSLL4Z

Bg0p3b6kLsEeR\nJEmS1D20aEVZRz04EDgdqgdeBw7pSkUiVZ/DgwYwYMYLa2lqgU  
CQaMWIEgwcPLs0bvPgfpvb8I1v\nFBpW19RYJJlkSZIkVayWbj0jMx/Pzlsy8+LMfKI9g  
ILrVXKflMZYq6qqYuTIkYwYMYI5c+YwYsQl\nRo4cudwKo1ZZtAjOPhv694dNN4UZMw  
oFo9Va/J9Ms1XydwfmJ0mSJEIdQXOfelYn\nvoCnwHqGrNk\n5gOIDEpqiaqqKoYPH84  
mm2zC7Nmz21YkyoQ//hGGD4fttoPHHoNNNildsJIKSZIkdl7VFOBHAclnhaefPQHsA  
DyUmV9pn/BKzx5FIWfZdrPhw4czduzY1q8omjy50leotrbQh2jIkJLHKnVV9iiSJEms\nnu  
oeW7qM5HhgEzMnMXYGBwJslj0pqpmVFopEjR9KvX7+6bWjLehY1y7x58MMfwp57w  
re+Bf/4h0Ui\nSZIkSVK31NJC0buZuQggltblzBnAFqUPS61VyX1SGsutpqZmuRVEy3o  
W1dTUrPqG778PF1wAW20F\nffrA00/DkUdCjx4lrx5Kvm7A/OTJEmSpK6gpT2KXoyID  
wO3AHdHxBvAnJJHJTXTsGHDVrhWVVXV\n6PXITJwIP/5xoVH1gw/CZz/bThFKkiRJk  
tR1tKhH0XITI4YA6wBVmXIDKYNqT/Yo6uZmzICf/ASe\nfRYuvBD23rvcEUldgj2KJEm  
SpO6hWVvPlqJPRJwYEb+OjKMjYjXgw8Bo4MB2jVAqhdraQoFop51g\n991h6ISLRJIK  
SZIkNdDcHkU3AF8ApgC7AQ8DPwa+lZn7tlNsaoVK7pPSqtw++ACuvLKwtezt+\nGp\nwoFo169Sh5fW1XydwfmJ0mSJEIdQXN7FH0mM7cGiljfAK8An1rW2LqlmlocBHQA7g  
6M89tZMwl\nwF7AQuCwzHwiltYA7gdWB3oBf87M04rjBwG/Aj4ELAGOzsxHWxOfKkR

1NZxwAqyzDttxBwwcWO6I\nJEmSJEnq1JrVoyginsjMgU2dt+gNI3oATwO7Ay8BjwIHZ  
+b0emP2Bo7JzL0jYnvg4szcofjampm5\nMCJ6An8HTszMmoioBkZl5l0RsRdwcmbu2sj  
726Oo0s2ZA8OHw6OPwpgx8PWvQ9haRWoLexRJkiRJ\nn3UNzt55tHRELIh3AF+qdv9  
XC9xwEzMZOZm5GBgP7NdgzL7A9QCZOQmoiogNi+cLi2N6UViR9Eb\n/BVg3eLP  
VRSKUOpO3nkHzjgDttkGtt4apk+Hb3zDlpEKSZIkSc3UrEJRZvbIzLXrHT3r/bxOC9/z\n  
48C/6p2/WLy2qjEbQ2FFUkRMBuYC92XmtOKYU4Hzl+IFYCxwWgvjqgiV3Celydwy4fe  
/L/Qheu45\nmDy5UDDq3btD42urSv7uwPwkSZIkqStobo+iUmruvq+Gy0ASIDM/AAZEx  
LrAXRExDOrgWuA4zLz\nTxHxdeBaYI/GbnzYYYfRr18/AKqqqhgwYABDhgwb/vPHXI  
c9nxz5cqeKp93Pr7gCLr2Ul1b17w/jx\nVC9eDM8+y5BPfKJzxOe55130vLq6mnHjxgHU/  
b6UJEmSVPma1aOopG8YsQNwZmYOLZ6fBiyt39A6\nlq4AqjNzfPF8BrBLZs5tcK8zgl  
WZeX5EvLVsdVNEBFCbmevSgD2KKsQrr8Dpp8Ndd8HIkXDobBa\nnc3dSSmopexRJ  
KiRJ3UM5/rJ+DNgsIvpFRC/gIODWBmNuBQ6BusJSbWbOjYj1lqKqeL03hRVdk4tz\nZ  
kXELsWfwLMbOc8VA7vvgujR8MXvgAbbggzZsDhh1skkiRJkiSpBDr8r+vMXAlcA9wF  
TANuzMzp\nEXFkRBxZHDMReC4iZgFXAkcxp28E3FvsUTQJuC0z7ym+9kNgTPG1X  
xbPu51IW0cqTibVv/wlbLUV\nPPxw4Rg9GtZpaYuszqtiv7si85MkSZKkzq8cPYrlzDuAO

xpcu7LB+TGNzJsKfLGJez4GbF/CMNVZ\n/POfcMIJMGsW/OY3sEejrackSZIkSVIbdXi  
PonKzR1EX8tpr8POfw4QJ8LOfwVFHQc+y1Dalbs8e\nRZIkSVL3YGMXdT6LF8OII8K  
WW0IETJ8OxxxjkUiSJEmspHzmoajCdPk+KXffDQMGwJ//DPfeWygY\nfeQjQAXktgrm  
17VVen6SJEmSugeXaKhzmDULTjyx0l/oggtg330Lq4kkSZIkSVKhsUeRyuutt2Dk\nSLj  
mGhg+vNC0evXVyx2VpAbsUSRJkiR1D249U3ksXQrXXgtbbAHz5sHUqXDKKRajJE  
SJEkqlwtF\nFaZL9EmpqYFBg+Dqq+HWW+G662CjjVY5rUvk1gbm17VVen6SJEmSug  
d7FKnj/OtfhVVDDz4I554L\nBx9sHyJJkiRJkjoRexSp/S1cCOedBxdfDP/v/xWKRWutVe  
6oJLWAPYokSZKk7sEVRWo/mfC//1to\nUr399vD449CvX7mjkjRJkiRJTbBHUYXpNH1  
SnngCdtkFzjkHbrgBJkxoc5Go0+TWTsyva6v0/CRJ\nkiR1DxaKVFrz5sERR8Bee8F3vl  
NYRbTLLuWOSplkSZIkNYM9ilQa778PI14Ko0bBIYfAz34GVVXI\nnjkpSidijSJIkSeoe7F  
GktsmEiRPhxz+GzTaDmhrYYotyRyVJkiRJKlrBrWcVpkP7pEyfDnvvDSee\nCBddBLff3  
q5FokrvAWN+XVuI5ydJkiSpe7BQpJZ7443CCqKdd4b/+i+YMqVQMJIkSZIkSV2aPYrU  
\nfb98AFdfXeg/tP/+cPbZsMEG5Y5KUgewR5EkSZLUPdijSM1z331wwgmFBtV33QU  
BpQ7IkmsJEmS\nVGJuPaswJe+TMns2HHggHH44nHEGVFeXrUhU6T1gzK9rq/T8JE  
mSJHUPZSKURcTQiJgREc9ExCIN\nnjLmk+PqTETGweG2NiJgUEZMjYlpEjGow59ilmB

4R/4ylczsil4r19tvw05/CttsWCkPTpxcKRuHO\nE0mSJEmsKIWH9yiKiB7A08D uwEvAo

8DBmTm93pi9gWMyc++I2B64ODN3KL62ZmYujiewN+BkzLz\n7xGxK3A6sHdmLo6l9

TNzfiPvb4+iVm6FP7wBzj1VBgyBEaPho03LndUksrMHkWSJEIS91COHkWD\ngFmZ

OQcglsYD+wHT643ZF7geIDMnRURVRGyYmXMzc2FxTC+gB/B68fxHwKjMXFyct0K

RSKvwyCNw\n/PGwZAlMmABf/nK5I5IkSZIkSR2oHFvPPg78q975i8VrqxzMRRWJEX

EZGAucF9mTiuO2QzYOSle\njojqNi2XaLv5FrVJ+XII+HQQwtPMjvqKJg0qVMWiSq9B

4z5dW2Vnp8kSZKk7qEcK4qau++r4RaH\nBMjMD4ABEbEucFdEDMnMagq5fDgzd4iI7

YAJwKaN3fiwww6jX79+AFRVVTFgwACGDBkC/OePva56\nPnny5OaPf/ddqo89FiZMY

MjRR8PTT1P9+OPwwAN140eNGsUXvvAF9tInn7r5b7/9NhHBsGHDyp6v\n55573j7n1

dXVjBs3DqDu96UkSZKkyleOHkU7AGdm5tDi+WnA0sw8t96YK4DqzBxfPJ8B7JKZcxv

c\n6wxgUWaeFxF3AKMz8/7ia7OA7TPztQZz7FGUCbfcAieeCP37w3nnwac/3ejQ2tpa

RowYwciRI6mq\nqlrhXFL3YI8iSZIkqXsox9azx4DNIqJfRPQCDgJubTDmVuAQqCss1

Wbm3lhYLyKqid7A3sATxTn\n3AJ8pfja5kCvhkUiAVOnwu67Fx51f9VV8Kc/NVkkgsKK

q5EjRzJixAjmzJljkUiSJEmsSpArW4YW\nzFwCHAPcBUwDbszM6RFxZEQcWRwzEXiu

uCroSuDo4vSNgHuLPYomAbdl5j3F164FNo2lqcD/UCw0\ndTfLto6s4NVX4eijYbfd4L//

GyZPLhSMmqGqqorhw4ezySabMHz48LIViZrMrUKYX9dW6fJkiRJ\n6h7K0aOlzLwDu  
KPBTSSbnB/TyLypwBebuOdi4LsIDLMylF4MI18Ov/wlfPObMGMG9O3bolvU1tYy\ndux  
YZs+ezdixY11RJEmsJEISherwHkXI1q16FP31r3DCCfDxj8NFF8FWW7X4FvYokgT2K  
JIKSZK6\nCwtFleiZZwqNqqdNgwsugK9+FaJ1f9/dfvvtDB48eLmiUG1tLTU1NQwbNqxU  
EUvq5CwUSZIkSd1D\nnOZpZq7289RbV3/wmfOILsOOO8NRTsO++rS4SAQwbNmyFI  
UNVVVVIKRJVeg8Y8+vaKj0/SZIkSd2D\nnhajK8MEHcM01sMUW8Oab8M9/wsknw+qrI  
zsySZIkSZLUhbj1rKv7+9/h+ONhjTXg4oth223LHZGk\nCuTWM0mSJKi7KMtTz1QCL7  
wAp5xSKBSNGVN4olkbphJkiRJkiS59ayrWbgQzjoLBg6EzTcvPO7+\n4lPrikSV3Celkn  
MD8+vqKj0/SZIkSd2DK4q6ikyYMKHQe2iHHeAf/4BPfarcUUmSJEmSpApij6Ku\n4PHH  
4YQT4O23C32ldt653BFJ6mbSUSRJkiR1D24968zmzoUf/ACGDYNDDoHHHrNIJEmS  
JEmS2o2F\nnos7o/ffhvPNqq61g3XULfYiOOAJ69Fjl1Eruk1LJuYH5dXWVnp8kSZKk7sE  
eRZ1JJtx+O/zkJ4VG\nTU1sMUW5Y5KLTRx4kTGjx/PiltuyVNPPcWee+7Jd7/73VXOe  
/jhh7n22mtXOm9V9168eDGXXnop\nL774ls8//zwww/wyxx13HAcffHDdmHfffZerr76aefP  
msWTJEp588kmGDRvG0UcfXboPoQO19vNu\nnzrxVjXnggQf4wQ9+wJe//GUWLizI737  
3O2bOnMmvfvUrtt5660bf95FHHuEXv/gFf/nLX9qWuCRJ\nkiS1h8zsVkcH5U5o2rTMPff

M3GKLzIkTyx2NWqmmpibXW2+9fOONNzlz8+23386NN944b7rppjbP\na86YESNG5I  
wZM+rOb7vttoylvOSSS+qu/fjHP87tttsu33///czMfPTRRzMicvTo0W3MvmX+8pe\n5O2  
3396me5T7877vvvyYx/7WK677rq53nrr5UEHHZRPP/10k+/7zjvv5Oabb5677rprq3Mul  
+Lv\nzrL/Dvfw8PDw8PDw8PDwaN/DrWfl9sYbhUbVO+8MQ4fC1Kmw117ljkqtdNZZZ3  
HAAQdQVVUFwFpr\nrcW3vvUtzj777DbPW9WYBQsWcP7553PhhRfWzdInn33YdtttOf  
PMM+uuLV26lFdffZUIS5YA8LnP\nfQ4orl7pSK+++irz589v0z3K+XiDocHzqFGjqK2tZf7  
8+YwfP57NN9+8yfcdo3Ysn/70p8nsYg31\nJUmSJHubForKZckSuPxy+Oxn4d13Ydq0  
QsHoQx9q020ruU9KZ8/tvffe47777uPzn//8ctc//nP\n8+STT/Laa6+tdN7qq6/e5Lzm3Hu  
11VZjo402YsGCBcuN2XTTXnjTfqijIXXXQRzz33HL179wbg\n6aefBmDw4MGtT74ZS  
v39tfXzXtm8ltx7WdFnVfndffffd9O/fnw033LC5KUqSJEISh7NHUTnce2+h\nKNS3L/z1r9  
C/f7kj6lLuuOMOHnvsMWpqavj973/PRz7yEQBuuukmrrjiCu6+++6yxDV79myWLFnC\n  
Ouuss9z1ZeezZ8+ui7WxeWuttVaT8/r06bPKe2+77bY899xzK9x/1qxZ9O3bt9H3Bjj33H  
MZOnQo\nJ5100nLXr7rqKI599VVmzJjBIYccwvPPP8+8efOYOnUqY8aMYeONN17Zx9  
Hu2vp5r2xecz7vZfee\nOXMmJ510Eq+99hpXX301X/3qVznoolOWm/fGG29w//3388tf/p  
JbbrmIDVILkiRJUvuyUNSRnnsO\nhg+Hf/yj8FSzr30NIkr6FkOGDCnp/TqTIUOG8Npr/

H4449zxhInsOWWW/Lggw+y//77AzBhwoSy\nrtZ4/fXXAVYo+PTp0wegyRUuy+Zts802

Tc57//33W3XvKVOm8MQTT3DhhRey2mrLLyD89a9/zbPP\nPst7773HDTfcQK9evepe

+81vfsPAgQPZbrvtePTRR9ljjz0YN24cn/zkJxkxYgSHHnpoiwtFpf63\n2dbPe2XzWvJ5T

5s2jZtvpmIYMGCBXzmM59h9dVXr/t3CTBmzBhOP/30liUoSZIkSWVgoagjvP02\nnjBo

FV1xReKLZ734HxW0/apm//e1vfPe732XKICK888wzDBo0qO61Bx54YLlePKty6KGHM

m/evGaN\nXX/99bnhhhtWOqZnz8J/Tj169Fju+rKiw7KeQK2Z15p7L126IGOPPZYDDzy

Q4447boXXIz3lrKam\nhs0224wJEyawxx57AlVCyHbbbQfA888/z2qrrcb+++/PokWLupP/

++9lpp50azaUIMpNoQ6G0M3ze\nX/ziF7n++uvr8lh77bXZZZdd+OIPf1pXKLrpppvYc88

9WXvttevu05a8JUmSJKk9laVQFBFDgYuA\nHsDVmXIul2MuAfYCFgKHZeYTEbEGcD

+wOtAL+HNmntZg3onAWGC9zHy9fTNZhaVLC0Wh006D3XaD\nKVPg4x9v17esrq6u

2FVF1dXVdVt6TjjhBHbbbTc+9rGPATBjxgzmzp3bogLG9ddfX9L4NthgA6BQ\nnoKlvWc

+gZU2Rm5o3depUvva1rzU6rzX3PvXUU9l888256qqrVhr34MGD+dznPsfBBx/MCy+8w

Jpr\nrsmpp55a93p1dTW77LILAL17925Vkeg73/kOzzzDH379q279tJLLwEwfVz45caut

956/Pa3v13l\nPdv6ea9sXnPvXb/4s+y/vTXXXJNp06ZRW1vLokWLmDZtGmecccZy97

GZtSRJkqTOqsMLRRHRA/gV\nsDvwEvBoRNyamdPrjkb+ExmbhYR2wOXAztk5rsRs

WtmLoyInsDfl2LHzPx7cd4ngD2A5zs6rxVM\nmgTLVnHcdBPssEN546kwf/zjH/n5z39e  
d37//ffTt2/fuid4lcPHPvYx1lxzTebOnbvc9WXblJp6\nGtayecu2RDU2b911123RvS+66C  
LWXntxowZA8ALL7zARz/6UV5//XW22WYb9tlnH6688sq68Z/6\n1Kd46KGHmDZtGttu  
u+1y97rnnns46qijmvUZNOV3v/vdCkXMZStxDjnkkFbds62f98rmNefzXrBg\nAVtvvTUH  
HHAAF1xwQd2Yt956i4igZ8+eTJw4kenTp3P44YfXvX7ffffx/vvvc/jhh7PvvvtywAEH\nntC  
p/SZIkSWoP5VhRNAiYZIzACJiPLAfML3emH2B6wEyc1JEVEXEhpk5NzMXFsf0orAiqf  
5f1xcA\nJwN/bt8UVuLII+HUU+Geewrbzb7zHVit4x4uV6mrieA/ub3++uu8/PLLy207q66  
uZscdd2zR/Uq9\n9axXr17sscceTJs2bbnrjz/+OAMHDmT99ddf6byGW6Uazmvuvf/whz  
+w2mqrLbeK5YorruAXv/gF\n8+bN45VXXImhKDV37lw+9KEP0a9fPz744APuvfdedttN/  
7973/z9NNP160ogkK/nZNPPnmln0Vj\nGvu32ZaVNW39vFc1b1Vj3nnnHd577z222GIL  
4D/5zZw5k+23354+frrw/e9/n+9//vL3WPXXXcl\nlruutanbskSZIkZvM7NADOB  
D4Tb3  
z7wCXNhzhG/Dleud/A7Yp/twDmAwsAMbUG7MfcGHx59IA\n3ybeP9vFokWZl0dm9u2  
bedppmW+91T7vo1ywYEH26tUrJ0+enJmZM2fOzHXXXtfPO++8MkeWeccd\nnd+T666  
+fb775ZmZmzp8/Pz/84Q/nLbfcUjdm4sSJd566+Xdd9/donnNGXPnnXfmoEGDcvTo0T  
lq\n1KgcNWpUnnPOObnXXntlZubSpUtz6NChOWXKILo5c+bMyV69euWpp56amZmX

XXZZRkTOmDEjL7jg\nglxrrbVy/vz5mZl52223Lfd+bTFu3LgcN25cm+5R7s/7tNNOy5kz  
Z9adT5o0KXv37p2PPfZYkzHv\nnuOOOudNOO7Up73lo/u7s8P/P8PDw8PDw8PDw8P  
Do2KMck4qau4SgYbfXZVWeD4ABEbEucFdEDAEe\nAU6nsO2sqfntlxNuvhIOGkGD  
oRHH4VNN+2Qt25MpfcogJkCH369OGqq65i9OjRDBgwgGeffZa3\nn3nqrJA2W22ro0K  
GMGTOGI444gv79+/Pkk09yySWXsN9++y03bsmSJcutlBo6dCjf+973VjpVfd+\n7bXX  
OPDAA1m4cCGPPvrocu+3rLFyRDBhwgTOOeecui1Szz33HJdddhk/+MEPgELPom9/+  
9vceOON\n9O/fn8svv5yTTz6Zfv360a9fv1ZvFWuPf5tt+bxXNa85Y84880zOOecc5s6dy  
/z58+nVqxcPPfQQ\n/fv3XyHWP/3pT1xxxRU8/PDDRAR77rknRx11IfvPJEmSJHUqkd  
mxTVUjYgfgzMwcWjw/DVia9Rpa\nR8QVQHVmj+ezwB2ycy5De51BrAluBO4h0Lja4C  
NKfQ/GpSZ8xrMyUMPPZR+/foBhaa0AwYMqPsD\ntrq6GqB551OmUH3IIfDmmwy5+m  
rYbbdmzX/ooYf40Y9+RFVVVd3rAwYMoKampu5x3K2Kh0Jvmlbn\n08nP/3c8PXrrruO  
O++8k1deeYUHHnig08Rbqvwwq5bxhfjfeeCPTp09nyJAhnSK+UudX7nhKkc+4InceMA6  
NevH2eddRaZ6ePaJEmSpApXjkJRT+BpYDfgZQqrgQ7OFZtZH5OZexcLSxdI5g4RsR  
6wJDNr\nl6l3cBdwVmbe0+A9ZIPYqrbCU88iltuc86uvwhlnFFYS/fzn8MMfQs/mL86qra1  
IxlgRjBw5kqqq\nqhqXotXI//eIP+dKXvsSwYcNYunQpW265JYceeinn356uUOTKIZEWCi

SJEmSuoGO67JclJLgGMo\nFHmmATdm5vSIODIjijyOmQg8FxGzgCuBo4vTNwLujYj  
JwCTgtoZFomVv0y7BL14MF18MW24JvXrB\n9Olw9NEtKhJBXRXTyJEjGTFiBHPmzL  
FI1ALz589nzJgxdU+fOv/88+nXrx+nnHJKmSOTJEmSJKn\n6/AVReXW6hVFd90FJ5w  
An/gEXHQRIOAx7HPmzGGTTZh9uzZdVvh2qq6G/QouvTSS1m0aBGvvvoq\nffr04fT  
TT6dnC4t1nVElf3dgfl2dK4okSZKk7qHr/3Xd3mbOhBNPhBkz4IILYJ99INr+t1JtbS1j\nnx  
45I9uzZjB071hVFLXDssceWOwRJkiRJkiqSK4qa8uabcPbZMG4cnHIKHHccrL56SWK  
wR5GkrsYV\nRZIkSVL3YKGooQ8+gOuuKzSr3ntvGDKSPvrRksZw++23M3jw4OWKQr  
W1tdTU1DBs2LCSvpcklYKF\nlkmSJKI76PBm1p3agw/CdtsVCKW33QbXXFPylhHAsG  
HDVlg5VFVVVZliUf1HdFeaSs4NzK+rq/T8\nJEmSJHUP9igCeOEFOPIk+L//gzFj4KCD  
StKHSJlkSZIkqSvp3lvPFi4sFIYuvRSOPbZQLFpzzfIG\nKEmdkFvPJEmSpO6he64yo  
QbbywUhr78ZXjiCfjkJ8sdISRJKiRJUll1zx5FO+1UWEn0+9/D+PEV\nVSSq5D4plZwbm  
F9XV+n5SZIkSeoeueKosMOg8MPhx49yh2JJEmSJEISp9G9exRJkprFhkWSJEIS\n9  
9A9t55JkiRJKiRpBRaKKkwI90mp5NzA/Lq6Ss9PKiRJUvdgoUiSJEmSJEEmAPYokSc1gj  
yJJkiSp\nne3BFkSRJKiRJKgALRRWnkvakVHJuYH5dXaXnJ0mSJKI7sFAkSZIkSZIkwbB  
5FkqRmsEeRJEmS1D24\nokiSJEmSJEIAGQtFETE0ImZExDMRcUoTYy4pvv5kRAws

XlsjliZFxOSImBYRo+qNHxsR04vjk/Kr\nowAACtVJREFUb46IdTsqn86ikvukVHJuYH5d

XaXnJ0mSJKI7KEuhKCJ6AL8ChgKfAw6OjC0bjNkb\n+Exmbgb8ELgcIDPfBXbNzAHA

1sCuEbFjcdpfga0ysz8wEzitl/LpTCZPnlzuENpNJecG5tfVVXp+\lnkiRJkrqHcq0oGgTMy

sw5mbkYGA/s12DMvsD1AJk5CaiKiA2L5wuLY3oBPYDXi9fvzsylxdcmARu3\anaxadUG

1tbb1DaDeVnBuYX1dX6flJkiRJ6h7KVSj6OPCveucvFq+taszGUFiRFBGTgbnAfZk5rZH

3\ln+B4wsWQRS5IkSZIkVbhyFYqa+9ixhk/YSYDM/KC49WxjYOeIGLLcpIgRwPuZ+Ye

2BtrVzJkzp9wh\ntJtKzg3Mr6ur9PwkSZIkQ9RjkfFR8QOwJmZObR4fhqwNDPPrTfmC

qA6M8cXz2cAu2Tm3Ab3OgNY\lnJnnFc8PA44Adiv2M2r43h2fsCRVgMxsWLyXJEmS

VGF6lul9HwM2i4h+wMvAQcDBDcbcChwDjC8W\lnlmozc25ErAcsczaiOgN7AGcBYUn

qQHDKRSUVigSgX/oSJIkSZIkNaUshaLMXBIRxwB3UWhGfU1m\lnTo+II4uvX5mZEyNi

74iYBbwDHF6cvhFwfUSsRmHr3G8z857ia5dSaHB9d0QAPJSZR3dcZpIkSZIk\lnSV1X

WbaeSZIkSZIkqfMpVzPrdhcR10bE3liYWu/a2liYHhFPRsTNEbFuOWNsiybyO7uY2+SI

uCci\lnPIHOGNuisfqvXZiRCyNiL7liK0Umvj+zoYlFyPiieIxtJwxtlZT311EHFv87++fEXFu

U/M7uya+\nu/H1vrfZEfFEOWNsiybyGxQRjxTzezQititnjJIkSZLaT8UWioDrgIZ/aP8V2C

oz+wMzgdM6PKrS\naSy/MZnZv/hEuFuAn3d8WCXTWH4Ui197AM93eESI1Vh+CVyQ

mQOLx51liKsUVsgtlnYF9gW2zsP\nA+eVI7ASWSG/zPzmsu8NuKI4dFWN/m4Bzijm9

7PiusrJkqQKVLFosx8EHijwbW7M3Np8XQSsHGH\nB1YiTcS3oN5pH+DVDg2qhBr

Lr+gC4OQODqfkVpJfl2+23kRuPwJGZebi4pj5HR5YiazkuyMKzdG+\nAfxPhwZVQk3k9

wqwbAVmFfBShwYISZlkqcNUbKGoGb4HTCx3EKUWESMj4gXgUGB0ueMppYjYD3g

x\nM6eUO5Z2dGxx++A1EVFV7mBKADNg54h4OCKql2LbcgfUTnYC5mbms+UOpMR

OBc4v/m4ZS9dejSIJ\nkiRpJbploSgiRgDvZ+Yfyh1LqWXmiMz8JDAOuLDM4ZRMRKwJ

nM7y2+m6/OqbBi4HNgEGUFjBcX55\nwymponsCHM3MHYDgwocxtJeDgYr7vQJcAxx

X/N3yY+DaMscjSZlkqZ10u0JRRBwG7A18u8yhtLc\nAJXUcPbTQD/gYiYTWHb4OM

RsUFZoyqhzJyXRcDVwKByx1RCLwl3A2Tmo8DSiPhleUMqrYjoCRwA\n3FjuWNrBoM

z8U/HnP1JZ/zYISZlk1dOtCkXFp0gNB/bLzHfLHU+pRcRm9U73A7rsk5caysypmblh\nZ

m6SmZtQKDx8MTPnITu2UomljeqdHgCs8MS3LuwW4CsAEbE50CszXytvSCW3OzA9

M18udyDtYFZE\n7FL8+SsUHgYgSZlkqQL1LHcA7SUi/gfYBVgvIv5FYcvSaUAv4O5Cz

1keysyjyxdl6zWR394RsQXw\nAfAshQbCXVK9/D5SzO9nmXldvSFZnshKo4nvb0hEDK

CQ22zgyDKG2GqNfXcUtipdW3zk+vWAiWUM\nsU1W8m/zILpwE+tlGvm3+TPgh8BIEb

E6sKh4LkmSJkCRWGXiRJkiRJkrq7brX1TJIksZlkSU2z\nUCRJkiRJkiTAQpEkSZIK

SZKKLBRJkiRJkiQJsFAkSZIkSZKklgtFkiRJkiRJAiwUSZIkSZIkqchC\nkSRJkiRJkgDo  
We4AJHV+EbER8Flzh2dm9mjPeCRJkiRJ7cNCkaTm2BvokZlZ7kAkSZIkSe3HrWeS\n  
Vioi1gTes0gkSZIkSZXPQpHUzUXE6qsYsh9wSzPvtUbbI5IkSZIkYuFInVpEfFBRDwR  
EVMi4ual\n6NPK+6wbET9qxbzjImJaRPy2Ne/b4F5vF+M4uq33asF77gOsvYpha2fm2/  
XmfC4iHoml30bE+sVr\nAyPiKeAHEbF7O4YsSZIkSWpHForU1S3MzIGZuTXwFnBkK  
+/zYaA1BZofAbtn5ndb+b71JVBVvGe7\nKzaoXiczX13JmD2BO+tfy8xpwO3APZk5f9lI4  
OuZ+SvgcxHRu53CliRJkiS1IwtFqiQPA58Gili\nRMTU4nF8/UFNvDYa+HRxddK5DW/c  
2JyluALYFLgzIk5oMH5U/ZVBEXFmRJy4qtgaiyMi/hQRj0XE\nPyPiiHr3PCMizkTEgxH  
xh2X3L772nYiYVLzPFRHR2H/rhwN/qjdnl4j4aYMx/TLzhUbmvgh8ot75\nVsUCEhSKS  
Ac3MkeSJEmS1Mn51DNVhIjoAewB3BMR2wCHAYMoFEMnRcT9mTm5qdeAUygUO  
wY2cu/G\n5IRn5IHFFTdDMvP1BtNuBC4Cfl08/zrwXyu515PFcacCh28Qx/cy843iKp1HI  
ulmCgWxrwFbA72A\nfwCPFePdEvgG8OXM/CAifg18G2i4PW6DzFxU7/yfwMilGJ2ZSy  
KiPzB5xU8bKBSKBhXfbzfgnmUv\nZoazEXFME/MksZIkSZ2YK4rU1fWOiCeAV4CNg  
SuBHYGbM3NRZr4D3AzsVBy/stea0ticnVc2ITMn\nAxtExEbFgssbmflSa+4FHB8Rk4G  
HijluBgwGbsnM94v9g24Dojh+N2Ab4LHiZ/MVYJNG7rtc4+nM\nfa24FTigeOILmTmpiZ

heBD5RLNBtkJn/bvC6RWhJkiRJ6oL8Y05d3aLMHFhcbXMXsC+FfjIRb0wU\nr7GK15r  
SmjkA/wscCHwUGN+ae0XEEAqFnx0y892lul9Cgaex+9R3fWaevor4PtTlteuAcRHxIPD  
S\nSua+SKFotR+F4IJDa67ivSVJkiRJnZArilQRiluojgNGAg8C+0dE74hYC9i/eI2VvPY2  
TT/9a2X3\nW5kbKfTqOZBC0ag591rQII51KKxGejciPgvsQKFIVAN8NSJWLz7pbRj/KTj  
dAxxY74IkfSPik43E\n90HDC8Xm1O8Ax1PoNdSozHwT6AssLa6MamhpU3MISZIkSz2  
XK4rU1dWtxin2IJoFbAGMAx4pvvSb\nZT2AMvOJiGj0tYioiYipwMTMPKXefZucw0pWA  
2XmtGIR58XMnNuce2Xm6/XjAM4AjoqlacDTFLafnkZmPRcStwBRgLjAVeLP42vRiU+  
q/FptYL6bwRLeGTakXNhH61cBnM3NVxZ4aGIINFBFBoeAISZIk\nSepilrM5O2gkdTYR  
sVZmvhMRawL3A0cUeyM1d/5JwDWZ+UaJ4+pPodB0YynvK0mSJElqf249k7qu\nnq4rN  
qh8H/tiSIIHRbyg8ja3UduM/W+0kSZIkSV2IK4qkbiwidgKez8yG29Jae7+tgJ71ttNJkiRJ\\  
nkroQC0WSJEmSJEkC3HomSZIkSZKkIgtFkiRJkiRJAiwUSZIkSZIkqchCkSRJkiRJkgA  
LRZIkSZIk\nSSqyUCRJkiRJkiTAQpEkSZIkSZKkLB RJkiRJkiQJsFAkSZIkSZKkov8PJH  
TJnw9eYIYAAAASUVO\nRK5CYII=\n",  
"text/plain": [  
"<matplotlib.figure.Figure at 0x3d6d390>"

```
]

    },

    "metadata": {},


    "output_type": "display_data"


},


],


"source": [


    "plt.plot(xdata, ydata, 'kx')\n",


    "#I have plotted the x and y data points and have used blue cross as markers\n",


    "\n",


    "plt.xlabel('Root of voltage $(\\sqrt{V})$')\n",


    "plt.ylabel('Radius $(m)$')\n",


    "plt.title('Electron beam path radius against root of voltage')\n",
```

```
"plt.savefig('Unweighted plot.pdf')\n",

"#Here I have labelled the axis and title\n",

"\n",

"slope = np.sum((xdata - mean_x)*ydata) / np.sum((xdata - mean_x)*xdata)\n",

"intercept = mean_y - slope*mean_x\n",

"slope_error = np.sqrt((np.sum((ydata - slope*xdata - intercept)**2))/(np.sum((xdata
- mean_x)**2)*(n - 2)))\n",

"intercept_error = np.sqrt(((1.0/n)+((mean_x**2)/(np.sum((xdata - mean_x)**2)))) *
((np.sum((ydata - slope*xdata - intercept)**2)/(n - 2.0)))\n",

"#These are my calculations using the above equations\n",

"\n",

"plt.line, = plt.plot([12, 18], [slope*12 + intercept, slope*18 + intercept], 'r-')\n",
```

```
"#I have plotted a least-squares fit line by using an array for two points calculated  
from the values above\n",  
  
"\n",  
  
"plt.text(24, 0.046, \"Gradient \", = \", {0} \", \pm \", {1}\").format(slope,slope_error),  
size=18)\n",  
  
"plt.text(24, 0.042, \"Intercept \", = \", {0} \", \pm \",  
{1}\").format(intercept,intercept_error), size=18)\n",  
  
"plt.text(14, 0.034, \"$y \", = \", {0:0.4f} x \", + \", {1:0.4f}\").format(slope,intercept),  
size=18)\n",  
  
"#I have added an equation for the line in the form y=gx+c into the graph\n",  
  
"#I have also added the unrounded values for the gradient and intercept\n",  
  
"\n",  
"plt.grid()\n",
```

```
"##I have added a grid so that it is easier to see where each point lies"
```

```
]
```

```
}
```

```
{
```

```
"cell_type": "markdown",
```

```
"metadata": {},
```

```
"source": [
```

```
#####Unweighted slope and intercept values"
```

```
]
```

```
,
```

```
{
```

```
"cell_type": "code",
```

```
"execution_count": 5,
```

```
"metadata": {  
  
    "collapsed": false  
  
},  
  
"outputs": [  
  
    {  
  
        "name": "stdout",  
  
        "output_type": "stream",  
  
        "text": [  
  
            "Gradient = 0.00231074149446\\n",  
  
            "Gradient Uncertainty = 0.000206780294614\\n",  
  
            "Intercept = 0.00537123902537\\n",  
  
            "Intercept Uncertainty = 0.00313597843668\\n"  
  
        ]  
    }]
```

```
}

],


"source": [

    "print \"Gradient =\"", slope"\n",

    "print \"Gradient Uncertainty =\"", slope_error"\n",

    "print \"Intercept =\"", intercept"\n",

    "print \"Intercept Uncertainty =\"", intercept_error"\n",

    "#These are the precise printed values for the above"

]

},


{

"cell_type": "markdown",


"metadata": {},
```

```
"source": [  
  
    "The rounded values for the above are as follows:\n",  
  
    "\n",  
  
    "$$ g_{1} = (0.0023 \pm 0.0002) \frac{m}{\sqrt{V}} $$\n",  
  
    "\n",  
  
    "$$ c_{1} = (0.0054 \pm 0.003)m $$"  
  
,  
  
{  
  
    "cell_type": "markdown",  
  
    "metadata": {},  
  
    "source": [  
  
        "#####Weighted graph equations"
```

```
]

},

{

"cell_type": "markdown",

"metadata": {},


"source": [

    "This is my unweighted graph. I have used the following equations."
]


},


{

"cell_type": "markdown",

"metadata": {},


"source": [
```

"The weight given to each point is:\n",  
"\n",  
" \$\$ w\_{\{i\}} = \frac{1}{(\Delta y\_{\{i\}})^2} \$\$\$"  
]  
,  
{  
"cell\_type": "markdown",  
"metadata": {},  
"source": [  
"To calculate weighted gradient, \$g\_{\{2\}}\$:\n",  
"\n",  
" \$\$ g\_{\{2\}} = \frac{\sum w\_{\{i\}} \sum w\_{\{i\}} x\_{\{i\}} y\_{\{i\}} - \sum w\_{\{i\}} x\_{\{i\}} \sum w\_{\{i\}} y\_{\{i\}}}{\sum w\_{\{i\}} \sum w\_{\{i\}} x\_{\{i\}}^2 - \left(\sum w\_{\{i\}} x\_{\{i\}}\right)^2} \$\$\$"  
]

]

},

{

"cell\_type": "markdown",

"metadata": {},

"source": [

"To calculate weighted gradient uncertainty,  $\Delta g_{\{2\}}$ :  
\n",

"\n",

"\$\$ \Delta g\_{\{2\}} = \sqrt{\frac{\sum w\_{\{i\}}}{\sum w\_{\{i\}}} \sum w\_{\{i\}} x\_{\{i\}}^2 - (\sum w\_{\{i\}} x\_{\{i\}})^2} \$\$"

]

},

{

```
"cell_type": "markdown",

"metadata": {},


"source": [

    "To calculate weighted intercept, $c_{1}$$:\n",

    "\n",

    "$$ c_{1} = \\frac{\\sum w_{i}x_{i}^2 \\sum w_{i}y_{i} - \\sum w_{i}x_{i} \\sum w_{i}x_{i}y_{i}}{\\sum w_{i} \\sum w_{i}x_{i}^2 - (\\sum w_{i}x_{i})^2} $$"

]

},

{

"cell_type": "markdown",

"metadata": {},


"source": [
```

"To calculate weighted intercept uncertainty,  $\Delta c_1$ :  
"\n",  
$$\Delta c_1 = \sqrt{\frac{\sum x_i^2 w_i}{\sum w_i} - \left(\sum w_i x_i\right)^2}$$
  
]  
,  
{  
"cell\_type": "markdown",  
"metadata": {},  
"source": [  
"#####Weighted graph"  
]  
},

```
{  
  
  "cell_type": "code",  
  
  "execution_count": 6,  
  
  "metadata": {  
  
    "collapsed": false  
  
  },  
  
  "outputs": [  
  
    {  
  
      "data": {  
  
        "image/png":  
  
          "iVBORw0KGgoAAAANSUhEUgAABloAAAEjCAYAAABdOup0AAAABHNCSVQICAgIf  
          AhkiAAAAAIwSFIZlnAAALEgAACxIB0t1+/AAAIABJREFUeJzs3XmcXuP9//HXRxJiiYw  
          1tQ9FESWoiKaVxNlSYTaal9+\nWrEEDUIJQhlbfiiFCWIFbUvsbZMaOxtKiSxhIRal2Q  
      }  
    }  
  ]  
}
```

EQUQ+vz+u605OTu6Z+9wz98w9c8/7+XjM\nY+Y+5zrX+VxnCee6r+tzzN0RERERER

ERERFZqtwBilililililhI66COlhERERERERAdRRJCl\nlilililikTqKREREREREREQE

UEeRililililhE6igSERERERERFAHUXNwswON7Onyx1Hscxs\nhpntVO44mltLt9P

Mbjaz8+LfPzez11pq301IZgeZ2aPljqOlmdkxZvaxmc0xs5VKWG+tmR1Zqvpe\nRERER

ERKTR1FjRQ7G+aa2ReJnytLWH+1mS0ws5Y8Rx5/Kkaykyahpdu5cH/u/rS7b9KC+24

Sd/+r\nnu/9fU+uJ1/lGpYgpw76adO+YWSfgD8BO7r6iu88uYXgLr4W22qEsliliKVrWO5

A2jDHBJo7k80\n836s3hVmHdz9+2bevyQ04ZjXex7bkczHoETXdmOP+Q+AzsDUJu5f

RERERESkdGlohZgZpuY2eNm\n9qmZvWZm+ybWLWtmf4gjlOrM7Ckz6ww8FYvUxe

kvvellhAlmdpmZzQJGmNmKZvYXM5sZ6xhuZhbr\nPtzM/mVmI83sMzN728x2LRBuTz

ObHMv/2cyWScQ60Mz+a2azYxw/Tqz7nZlNi7FONrM9E+uScc+O\n5X5qZkeY2btxis+

hDRy/WjO70MyeN7PPzeze5HQgM7vDzD6Mx2+8mW0Wlx8FHAicGkd83Zeodisz\nnezl

uMzbZztS+8x3zDczsCTObZWafmNmtZtY1sc1WZvafeCzGEjodcuv6mtn/Ep8XG2mTm

qa2qp9\nGl/Zp/HayNv5YWZXxGP5uZm9ZGY/S6xb1szGxHM6xcxOTcVQ6Nw9nf8w

MwGm9kbMa6rE+s2jMe\nLh6X2+Ly3LX8cjwPC6//Ase5oWvbzOzMnPzj2L4VY3XJe+

cLM9suz/6WMbNRZvZ+/LnczJY2s41Z\n1EFUZ2b/yLPtw2Z2XGrZy7njFq/tF+NxeMHM

ts9TxybAtcD2McP4vIBZjYxnsd3zWxEartDzeyd\neO3l2r9T4pjkuUsM7vdSjhtTkRER  
ERE2gd1FDVNwRELZrY88DhwK7AasD9wjZltGotcCmwFbA+s\nDJwKLAB+Htd3jdNfn  
oufewJvAasDFwBXA12A9YE+wKHAEYkQegKvAasAlwA3FmjPgcAvgB8CGwNn\nnxnZ  
sFbf9TYzzOuB+C9N0AKYBP3P3FYFzgVvNrFsqjpjftrcBfwe2jvs5GLjazJZrlZDYrvWA  
OYD\nyWI+44ANCcf3P8BfAdz9T/Hvi929i7vvkWjnvxD/EY7bFsDhDew7fcwNqlmxbAqs  
A5wTj9PSwL3A\nGGAI4A5gb7JPdUtOizsZ+B+watz36e5eXz0vAFvGff4NuCPGAjACW  
De2dRfC8U7WU+jcpQ0Afkl4\nbvuZ2S/i8vOAR9y9ClgLuArA3Xel67el5+GOeuot5to+A  
jgM6AtsAKwQy8Pi904Xd38+z76Gx/1t\nGX96Ame6+xtA98T2O+fZ9m/AAbkPFjom1wX  
GmdnKhOtxFOFavywuX6zDxt1fAwYDz8YYV46rvgQO\nndveuhON8jJntkdjP6LjvNYCu  
wJosOpnAI0AHeL62bG8ililhIZuooajwD7o2jKnI/+ZLUDgSm\nnu/sYd1/g7v8F7gb2tZB  
D5QjgRHf/MK5/zt3nUX8n1AfuPtrdFwDfAb8idCB85e7vEHKrHJlo/467\n3xg7GP4CrGF  
mq9dTtwNXu/v7MS9LDYseil8CrnP3Fz34C/AtoYMLd7/T3T+Kf/8deBNJuTIHQMN\nndB  
KtCfze3b9z98eBeYTOnvri+ou7T3H3ucBZhA4Ki/u7Obb/O0JHx5Zm1iWxppYOnClu38  
U2/kA\n0KOefUPimLv7N+7+lrv/M8Y+C7ic0JEB0Avo6O5XuPv37n4X8GIDdTdkHuGB  
vzrWNaG+gjGX0OwY\n42XAMsCP4up9gQvc/XN3fx+4gsQxyXDu0i5y9znu/j/gSRYdu3

IAtZmt5e7z3P2ZlttbzLV9EPAH\nd5/h7l8BpwP7x3sqy5SzAwnX36x4Ds9N1F1o+3uBH  
ma2TiKWu+L1NwB4PZ6PBe4+ItBROyhPPUvs\nx93Hu/vk+PcrwFgWXVv7APe7+zNx  
X2ezelffYEJn1weJe2Efa9k8Zylilili0sbpAaLxHNjD3VdK\ln/OQbrbMesF2yQ4nwkNqNM  
MqnM2EURVb/S/y9KtAJeCex7F3Cal6cjxYGH DpZIly+yFL/u4QOnVw7\lnTk61Y21CR0  
ZuSszExLrNCe3L+Tjx99cxnk9Sy4qJqxOwql1MLOL4nSbz4Hpsc yqDdQFieNS5L4x\ln  
s24Wpqu9F/d5C4vauibwfmr7dyhOrgNhJGG0z2Nm9paZnVbvBmanWJhWVhePf1cW  
HYM1U214L7Vt\ln oXOlxjx2cwmjfiCMhjPgBTN71cyOWGLLhhVzba+RZ11Hwn2VxZp5t  
l+zn rKLcfcvCKOGcp2o+xNH\ncscU63k1t8k7Wus1sOzN7Mk63qyN0/iSvrYXnzt2/Bj5Nb  
F4N3JM4j1Mlo++yHhMRERERERF1FLWA\nd4HxqQ6\Lu5+HOEh7xvyj6Spb4pRcvks  
wsiL6sSydUI1BBRp3dTfuU6Pd4GaVDtWcPfbzWw94E/A\nc cDK7r4S8Cq\TeCc jus7Qv  
sPJl zW2CIO11k/l sntO8uUr0Jl0usvAL4HNo/7PIRF99KHLN5RB6GT\ln rT5zgeSUuzVy+  
3P3L939FHf/laGNJ5nZjukKzOznwDBgX3evisf/cxYdgw8J0+Ny1klsW7Jz5+4f\ln u/tR7r4  
WoYPjGivuTwfFXNs f5Fk3n9AhmeWc59v+gyJivQ04IOYf6uzuT8bl77Pk+V6PJT sPqSf  
O\ln vx FGLK0dp/Bdy6Jz8QGhc xYluadYvEPvXWDX1D26nLt/WES7RERERESknVN HU  
dNkeZgeB2xsZgeb\ln Waf4s62ZbRK n2PwZuMzM1oijY7aPuWU+leQq+mF9FXt4K9Tfg

RozWyE+9A8l5ENqbHuOM7O1Yq6V\n4cDtcd31wNFm1jMmzV0+Jt5dAVie8NA7C1gq

jiTZvJEx1BfXwWa2acxj9HvgjjiNbQXCFLjPYj6o\nC1LbfkzlYVOo/mKsAHwFzDGztQid

NDnPAvPN7IR4rvCtM2grv8CB8Vzvyshv0wlKiQP3zBOsZtD\n6JzK9yawLoROklkWEj

KfDayYWP934HQzq4rxDmFRJ0VTz93CY2dm+5pZriOjLta7IH7+mAau5bQM\n1/ZtwF

Azq47X4AXA2HhPFbx34vZnWkgYviphGtctWeMDHiJ0AJ1LmB6WXL6xmR1gZh3N7F

fAJsCD\neer4GFg7kecLwrU1293nmVIPQkdozl3A7ol/l85h8Wv3WuACM1sXwMxWM7

N8U95ERERERETqpY6i\npnnAwhuLcj93xeULExLHaSq/IExPeZ8wuuNCIJdo+BTgFUI

em0/jOovTxGqACRbeVrVdst6E4wmd\nFm8DTxOmwNyUjiOhodEWHrd/jDAd7k3g/Ni

OfxMSWV8NfBbXHRrXTSHkj3mWMC1pc+BfqXqLiSNf\nXLcANxOO39KExL0Q8i69Q

zi2r8YYknXfCGwWp+Pc3UD9DY3gSq87l5CI+3NCfqO7WHS+5wF7EZJj\nfwrsF9en68

w5EdidkHj4QOCexLoNCYnQvwCeAUa7+/g8MT4Sf94AZhCm0iWnP/2eMBJnOuHc3k

H\nJ9SYc5fvPOaW/QR4zsy+AO4DTnD3GXHdOcCYeB72ydOGYq/tPxOuiafi+rmxPKI

7Z3bscEk7H3gJ\nmBR/XorL6mvn4sGG83w3sBNhFFBu+WeEvGQnEzrfTgEGxuVp/w

QmAx+Z2cy47Fjg92Y2h5CLK9dR\nS8xddDyhY+oDwnUxk9BRCiH31P2EqYpzCOc0X

9tFRERERETqZV7vS5Sacadh5MQooANwg7tfnKfM\nlcBuhAfAw919YmJdB8KD3Xvuv

ntc1pPQidGJMLriWHdvbBJhaUXM7EngFnf/c7ljqQRmdgywn7v3\nK3cs0nhxJNVsYM  
OY7FtERERERKTJWnxUEezkuRrYFdiMkOdj01SZ/oSHn40lb9v6Y6qaEwmJWpO9\nX  
JcAZ7n7VoRpJJc0TwukTEqZ76hdMbMfmFlvM1vKzH4EnMTil5ekjTCz3c1suTjN8IJgkj  
qJRERE\nRESklMox9awnMC2+1vo7wjSKPVJIBgFjANz9eaDKzLoBxBwo/YEbWLzz4  
EPCm54AqsifPFbarpYf\n+IY5libkr5IDmO50L3BNWSOSxhpE+LftfUIOpv3LG46liliFSA  
jmXY51os+aru7TKUWYuQ/PVy\nQvLgFVPb/A74l5ldSugA276EMUsZaYpU07j7u8CPy  
x2HNJ27/4aQK0xERERERKRZIGNEUdaRlemp\nRmZmA4GZMV9Rev2NhOS56xLejq  
R8NililililiRSjHiKL3gXUSn9chjBhqqMzacdnewKCYw6gz\nnsKKZ/cXdDwV6uvvOsfydh  
KlpSzAzTWESEWkEd1euMBERERGRClеOEUVvARuZWbWZLQ38ivBK56T7\nnia9eN  
7NeQJ27f+TuZ7j7Ou6+PiE3xxOxkwhgmpn1iX/vSHhVeF7uXrE/I0aMKHsMapvap/ZV3  
o+\niliLQPLT6iyN3nm9kQ4FGgA3Cju081s8Fx/XXu/pCZ9TezacBXwBH1VZf4+yhgtJ  
ktA3wdP7c7\nM2bMKHclzaaS2wZqX1tX6e0TEREREZH2oRxTz3D3h4GHU8uuS30e  
UqCO8cD4xOeXWDlptoililil\niliIZFSOqWfSjA4//PByh9BsKrltoPa1dZXePhERERERaR  
+sveWeMDNvb20WEWkqM8OVzFpERERE\nnpOJpRFGFqa2tLXclzaaS2wZqX1tX6e0  
TEREREZH2QR1FlilililCaOqZilhkoKlnliliLt\ng0YUiYilililglol6iiPJeVlquW2g9rV1ld

4+ERERERFpH9RRJClililililgHIUiYhIBspR\nJCliliLSPmhEkYillilliaOooqjiVnCelktsG  
al9bV+ntExERERGR9qFjuQMQUEZHW67//hYsv\nLncUliJSKmbWCdgbOAb4vbv/s8wh  
STtmZl2BZQnPpR2A3DT3r9394/Yej0i5KEeRilgsoa4Ozj4b\nnbr8dzj8fjjpKOYpERErBzD  
YEbgM/BuYAnwFfAZcCGwE7ufulZtz/3sApwHZAD3eflFj3/4ALgA3c\nfW4z7X9TYM3  
W0kFIZv2B/YGpQHfgUXe/pVTbFioTO+6OB9YG1gPWBK5099sa2G9P4Gx3H5hn3Sb  
A\nKOB8d/9XgfjrradQGTM7CPgF8E6M+253vy+xvjPwa2B1QqfLlsA4d78mUeYc4Ox6  
dn29uw/OEo+Z\n7QDcADwDfAp0BTYGhiSv71i23uPTmHiyMrP9AHf3OxpB6ynUddr  
Ka7Vxuy/KefLzPYBtge+AVYF\n/uvuf0zV3+B1mDGeTPdgln1ljLnJxzCxrsH7PUs89dGII  
hERWcgdbbr0VTjsNBg6EKVNglVXgqKPK\nHZmlSNtmZh2BCwmjeU4CTs19e2ImKwD  
XAb8EBjRnHO5+i5i1IXQGTUqt/ojwQNwsnUTRJYQHrbJ3\nFJnZT4ExwEbuXmdmyw  
OvmdlX7n53U7fNWP8I4BZ3fz1uMxC438xWdfer8ux3OeAW4P3U8oGEa2sO\n4WH2g  
gLx560n475OBIYC3d39q1huupnNdPdnY7ELgJ8Bvd39OzP7CfCCmXVx99xY5W7AQ  
YSH2AWA\nE55PTweGFRHzUsDywJ7Ad4Rr69fu/kZi2yzHp6h4irRsE7dv9PVaqmu12  
P038Xz1B7q5+8mJZVeb\n2WB3vy5+znldZomn4D2YZV8ZYy7JMcxypWeJpyHKUVR  
hKjlPSiW3DdS+tq4S2vfKK9CnD4waBffc\nA3/6U+gkEhGRpomjKx4FdgW2dfd7k0Pc3f

1LwjfsXwHjWyCkXYAn0wvd/SF3P6u5dmpmSwG9gSea\nax9FGgHc4+51AO7+FfA3I  
MsxyLJtg2Vih93JhAdQYpkHgZeAc+rZ7zDgLRZNiVq4nbsfAVyWlfZ6\n6yIUJj64/h54O  
LaH2LH4VLIdhOfMVVk0MGFK/L1DosxMd7/N3e9x9/vc/X7CCItT3H1OETE7cLq7\nV7  
n7au6+f7LTicaY5fgUG09La+z12uRrtZH7b/T5Ao4EnkstGw3sDkVdhw3Gk+UeLGJfDc  
YcleQY\nZryes8RTL3UUiYi0c3PmwMknw047wQEhwAsvwHbbITsqEZGKchPQE9jd3  
T+tp8x7wH3uvqA5AzEz\nA3aiPCN6tiRMM3mqDPtejJktA/QDXk2tehXY0szq/aoky7YZ  
618AfAh0SZV5G1jJzFZL7XcX4GWg\noVw5BaeJZ6mngTKbxXhnppa/B+wSOwNx99+  
6+wbu/nVc/6P4e0Jim0tT++wFLOfuS3SWZog56/T4\nhspljqeInfZ6LdW1Wuz+S3C+5g  
GjUvfAVsDE+Hem6zBDPFnuwaz7ajDmZjiG0PBxLHQMG6SpZxWm\nb9++5Q6h2VRy  
20Dta+vaYvvcQw6iU06BXXaBV1+F1Vcvd1QilpXFzAYAvwLOdfcZDRR9mzAlLbfd\nK  
cD6wDqEb5x/BmwDPJObSmBmKwLnAl8S/r9+CnCau2+eqKcL4Zvxr4BOcT+rk+goMr  
M9CTmTfgoc\n5O6fJdZ1JnyrvTLhQW/kdwmiAz83sBMKli3mEb8p/TXjw6gnc5e63xsr2I  
kyr2xL4BLjczOa4+3FZ\nnjmEzWZ9wzNljReYk1tfXqZdl2y8LIXH3I4AN8tS/ISF31cL9m9I  
KQB93PzOer0bJUk+BMt/miqWW\nndyJ0Aq4LzMhT7WnAlyQ6Y9z9i8Q+OxKu5T0aEz  
OwsZldCnxByPX1QO76yyprPI1khJE0jdXY67Uk\n12rGMp9Cyc7XH4BawrSsU4E3CB

3cuTxRma/DhuKJI3oK3YM/yLivQjFnPoclut8LxdMgdRSJiLRD\nU6fCkCEwa1boLOrd

9wRiYhUrN8SOk8aTCDq7t8THxjMbHNCp8zthHw+M93912b2OCGPSi6v0T+B\n29z9s

rjsSRK5LGKZfwC3p8q84+5vx89rEPIVnWdm04CfA/fFdV0IU9TGuvvQuGwvoJ+ZvUZ4

kLoK\nmER4cBvu7t+a2R7An2P8xNwbd5vZvcB4dz++UUeytFaOv79KLf8y/m5o8nWW

bZduTP1mtgXhW/+h\nqdFlp1lg71BGWeppqMyrhJEUa6SW5zonVyXRUWRmxwl/BJY

BDnX3efXU+xvCtfFNI2PeDNjl3T1e\nt9PM7Ft3v7fAdvVpKJ4GmdmtLHI+14rr9k8tn+X

uh2SotrHXa6mu1WKu5yafL3d/ycx2Ax4ArieM\nqtnF3efH7Yu5Dou6d9L3oJINzrKvDDE

Xcw6bfL9niKdBmnPwYSohT0p9KrltoPa1dW2lfV9+GRJV\n77AD7LEH/Pvf6iQSEWku

cVRCP+Bld5+ZWtfFzMaY2SNm9l8ze9HMroyrVwLuIYwgmgucCODuu7j7\nnwbfMDdA

51wEUfcXi07pqCFNnkW+ZvFpZ78AbrLwNrJ1gWQS2D8AXdz90hjzGsAgQt6L7YBx

QA9C\nh9F57p77lj83rSrZ3g5AHxqZgykeq4cz/vwIQ5W5h6XvU8tzD8QNfaGeZdui649

TWK4C7nT3KxPL\n9ya8GemLRPGiR6dkqadQmZhb61hg19xUGQsJejvFlou1192viSP

gLgXejNNp0nEtRRhN91hjYgb+\nAxwWY8uNDBoPnJ+uL4uG4snC3Q92992SP4R76d

L08oydRND467VU12qm/ZfqfMURNUcDhxE6TFYG\nXjSzQXGbTNdhsfdOvnswdthm2

VeDMVPaY1hQhngaVJYRRWa2K+E1bh2AG3xR5vtkmSuB3Qj/cTzc\n3Scm1nUgJJh

6z913Tyw/nnASvye8fvG0Zm2liEgb4Q533w1Dh4aE1ZMmwRrp70VERKTUViV8MTst\\nvSI+BBxmZhsSpgSc5+4j4rqnAcysH/CvXALVHDOrIkwfOC+xrCNhNNDFBcr8jMTUA3cfE9edBTyY\\n69Ays67AoUBtnLbQiTBN5KQ4NS23XT/gcXf/PBFiP8KUh6RtaEJ+Inc/rDHbNSDXcZf+4jyXq6Su\\nids2pv6LCNfCwneNxs65zdz9vFTZrDI5MteTdV/u/qCZfQQMM7PZhNEdzwC9gOn59u/uE8xsCnCb\\nma3ri79Zry9h1NHkYmOOdX/BkuYCm5IZVS5xcBHyxIMCRZ2zlMZero6W6VguWKdX5Aj4ndJSPiPmh\\n7jOzvxL+zbnJzNZ296/ruQ6fJV6Hjbx3IrgHY8wNXvNmZgViXosSHsNCMsSzti/KH5ZXi3cUxU6e\\nq4GdCUNjXzSz+919aqJMf2BDd9/IzLYjDNXtlajmRMlc7C6JbfoRvuHYwsMrGBdL/tZetMU8KVIV\\ncttA7WvrWnP73nwzTDN7/3249dYwmkhERFrELMKUrA4NIOkZf+cbadMP+Gue5T8lfAudHBn0E8L0\\nnucLIFmB1FvHLCRZPQQ4PLF447j9xe6+xBvSUjEu/NLXQk6jgYSpO0k7Aq+nR1aV0QeEh9NuqeW5\\n6R/ptzAVu+3nxdrvZr8FvnD3U+PndYGPgP7ApmZ2U6J4P2DpuOx+d7+ngVhzCtZDGHGQaV8e8iu9\\nllj/MOBFD6/8/gHwb0LHYzfjyvA9oRpRy8Ilv8CmJvnwTVLzl8DrxDeJHVSoTyKhFEY3xU6MHnU\\nF085NfZ6LdW1mqXMIEpzvjYFu noiibi7TzWznQkdkZsRrq9C1+HeheJJ3jv13YO56ZlF9rVZgZi7\\nx3Y3+RhmvN8zH8P6lGNEUU9gmsdkfmY2IpAkbGqizCDitxTu/ryZVZlZN3f/2MzWJvyjUUMi4R9w\\nDHChu38

Xt/uk2VsiltKKzZ0LF1wA114Lp58OJ5wAnToV3k5ERErD3eeb2R3AbmbWuZ58J7sTp  
mkl\nH5yJX3p2J89r7lHO8XdyxEM/4AV3n2dmvwNez1NmR2By/H/q0xKj+vckJKR+2EI  
OoomE0UMQ3gi0\nGDPbxN1fM7P1gOpUjHsSHvbui3VNcvdpcd/j4/ZLA8PcvSZP2/lvs  
zGEJNxZfOLuhzZUIB6nxwkP\nTEnbABMbepblum3W+s3sQGBBahnTB0cDZ7n4jcGOy  
Agt5ptzD67EzKaKegmXM7Aqgn7tvET8vTZhW\nn+NtYZHVCPpeVWWw3wrUxI7V8GxZ  
db0XFbGbLEzpIX09tvjHwfHo0XkZ54ymnxl6vpbxWM5Qpyfkyl\nswXAcnnaMsfM3iXmY  
St0HRZz7zR0D2bZF+Hf8AZjznguSnK/Z4mnUAXIyFG0FvC/xOf34rKsZS4n\nnvHkh/erQ  
jYAdzOw5M6s1s5+ULuS2o63kSWmMSm4bqH1tXWtqnzvcdx9sthIMmwYvvwwnn6xOI  
hGR\nMhlKeJPNLfEhCQhTA8zsKMLD8xvunn4TTI9CzqGXWNKzwDfE0fVmtiVhqsTU  
ODpo2XrK/IYwmr8T\nYWRRRTm/CNAWAhd19uru/Rugw+nEi5k5mdiawdly0I/ChuydHM  
/wUuJOQj2O72EkE4c1BuddCnwjc\nmqdd9XL3w3zJ/C71/TTYSZRwHbCvhbfHYWarA  
nsBv0+0eTcz+yR+E1/Uthnr/z/C8VjWzH4Xf04H\nnenj9SWc7Uv8X/rnnu4ZGsWWpp6Ey  
XVg0cg1Ce/7I7rcBuPsk4FEWb+d6hGmPI7n7rFR9PyB0VGax\nWDyxI+hmEqPkzKwn  
4U1W+ZKmZzk+xcSTVVOmneU09notybWasUxa0ecr/tvzhpk9lZEM/sllch4\nR3FRg9  
dhInhivVnuwULXfNaYm3wMU/Jez0XE0+BOW1rWREzpm8nMbCDhrQ8Tzaxvan1HYC

V372Vm\n2wJ/J/+r7kREKtZbb4WRQ2+/DTfeCDvtVO6IRETaN3f/1My2lbzF5p9m9j/CIL

T5wEOEEUVn5tm0\nnmvC2sfSXo7j7h3Haw0Vm9iYhh8gvCQmDRwKXuPtHecrsQfjSd

SRwRaLKscDphBH7f0os3xu42My6\nx3iXBsa4+1tx/QYsOTWuvrrOBw6KI6Uec/d38h2

vluTuj1jlv3S9mb0MbAmc4O73pYou8aCWZdtC\nZSwkxr2T8M3/tql9LvG2rvQdzQhJY

eb2aPAte5+j5n1Bk4gvK3JgTFm9jzwV0+9+auhejKWORM4\nx0JO2a6EKWXpt3ntB5w

RH4idcK0c5+43pNtFmAqzxHVeRMznxH11l0z1XB3Y3t1fTmyf+fhkiadA\nrGNZ8i1ka8

R1B6eWf+LuB2apt7HXaymu1SL33+TzBewTy9xC6GhfjpB6ZmiiTJbrsKF4/kjImZbl\nHs

yyr4lxl+oYZryesxzDepl70Qm0m8TMegHnuPuu8fPphGFeybnN1wK17j42fn6N8K3KCY

T50/MJ\nQ25XBO5y90PN7GHglo/z8Cy83nM7d/80tX8/7LDdqK6uBqCqqoePXoszC+

SGxWgz/qsz/rclj5\n/TUcc0wt99wDZ5zRI6FD4ZlnGl9fbW0tN998MwDV1dWce+65uHs

pvgoTEREREZFWrBwdRR0JcxJ3\nliTXegE4wJdMZj3E3fvHjqVR7t4rVU8f4BSPbz0zs

8HAMu4+wsw2Bv7h7uvn2b+3dJtFRJrTQw/B\n8cfDVlvBZZfBukv8y9d0ZqaOlhERER

GRdqDFcxTFeX5DCPNWpwC3e8jAPTh29uDuDwFvx1FB1xFe\neZ+3usTffwY2MLNX

gNsIrr/Nsd3ljAipRJbcN1L62rhztmzED9twTTjwRRo+GO+9snk4iERERERFp\nP8qRowh

3fxh4OLXsutTnIQXqGE/iNale3nZ2SAnDFBFplb79Fi69NlweGjoUxo6Fzp0Lbycili\nIIJI

i0/YCLBqAAAaGEIEQVQ9KzdNPRORtuyxx2DIENh0Uxg1CtZfv2X2q6lnlililiLtQ1IGFlm  
\\nSHHeey+MHvr3v+HKK2HgwHJHJClililiFcxRJ86rkPDCV3DZQ+9q65mr馮HlwySX  
Qowd07w6T\\nJ6uTSEREREREmo9GFImltFJPPBGmmVVXw3PPwYYbljsiERERERG  
pdMpRJCLSyzwAZx8Mjz7bMhD\\ntMceYGXODqQcRSllili7YOmnomoItBLffRfeZLbFFr  
DBBmGa2Z57Ir+TSERERERE2g91FFWYSS4D\\nU8ltA7WvrWtq+556CrbeGh5+GCZM  
gJoaWH750sQmlililiKSITqKRETK6OOPYcc3+OAAxZw9tnw\\n2GPwox9BXV0d48aN  
K3d4lililiLSzihHkYhIGcyfD3/8I/z+93DAAd/wzTdncMkIZ1NVVUVdXR3D\\nhw+npqaGq  
qqqcocKKEeRililiEh7oY4iEZEW9uyzcOyxUFUFV18dXnuf6xwaNmwYI0eObFWdRKC  
O\\nlhERERGR9kJTzypMJeeBqeS2gdrX1mVp3yefwJFHwj77wKmnwhNPhE4igKqqKo  
YNG8b666/PsGHD\\nWIUnkYililiItB/qKBIRaWbfffw/XXhs6hbp2halT4YADFn+bWV1dHS  
NHjmT69OmMHDmSurq68gUs\\nlililiLtIqaeiYg0oxdfDNPMOneG0aNhiy2WLJPOSaQc  
RSlliliUi7qKBIRaQaffgpnnAH33w8X\\nXwyHHLL4CKKcePG0bt378U6herq6pgwYQID  
Bgxooygbpo4iEREREZH2QVPPKwl54Gp5LaB2tfW\\n5dq3YAHccANsthksvXSYZnbo  
ofV3EgEMGDBgiZFDVVVVraaTSERERERE2o+O5Q5ARKRS/Oc/YZqZ\\nGTz8MGy9d  
bkjEhERERERKY6mnomINNHs2XDWWXDHXDBBXDEEbBUhY3X1NQzEREREZH

2ocleZURE\nWo47jBkTppnNnx+mmR15ZOV1EomllilSPuhx5kKU8l5YCq5baD2tTWT

JsEOO8DVV4eE1fvvX8vK\nK5c7KhERERERkaYpS0eRme1qZq+Z2Ztmdlo9Za6M618

2s61S6zqY2UQzeyDPdieb2Qlz0yObiJTc\nnnDkwdCjsvDMcdBA89xxsu225oxIRERERE

SmNFs9RZGYdgNeBnYH3gReBA9x9aqJMf2Clu/c3s+2A\nK9y9V2L9ScA2QBd3H5R

Yvg5wPfAjYBt3/yzP/pWjSESK5g633QbDhsFuu8GFF8Jqq5U7qpajHEUi\nlililu1DOUY

U9QSmufsMd/8OGAvskSozCBgD4O7PA1Vm1g3AzNYG+gM3AOmHlsuAU5sxdhFph

6ZM\ngR13hJEj4c474YYb2lcnkYilililtB/l6ChaC/hf4vN7cVnWMpcDw4AFyQ3MbA/gPX

efVNJo25hK\nywOTVMltA7WvNfriizCCqE8f2HtveOkI2H77/GXbYvtERERERETSytFRI

HxEv3q0kJnZQGCmu09M\nrjez5YAzgBENbC8ikok7/P3v4W1mM2fCq6/CkCHQoUO5

IxMREREREWleHcuwz/eBdRKf1yGMGGqo\nzNpx2d7AoJjDqDOwopn9BbgEqAZeNr

Nc+X+bWU93n5kO4PDDD6e6uhqAqqoqvToQd++fYFFowLa\n6ufcstYSTyk/9+3bt1X

Fo/ZVRvueffZZjjnmGKqqqqitreXdd+Gmm3ozffrXDBv2H7bYArp1a7vt\nna+zn2tpabr75Z

oCF/16KililiEjIK0cy646EZNY7AR8AL9BwMutewKhkMutYpg9wirvnmcf01Ey\naxHJoK

6ujuHDh3PGGTWMHI3FddctYNNN7+aee3ZmtdWqyh1eq6Fk1ilili7UOLTz1z9/nAEO

BR\nYApwu7tPNbPBZjY4InkleNvMpgHXAcfWV12RyytebkRAJarktoHaVy5du1ax/faXs

MkmC5g8+Ut2\n3/1MHnyw+E6i1to+ERERERGRYpRj6hnu/jDwcGrZdanPQwrUMR4Y

X8+6DZoao4hUvmnT4IQTYMaM\n5fnTn77gwANXYfr06VRVaSSRilili0T+VIZi3NKJdr

pBJVcttA7WtJX38NI0ZAr17Qty/U1tbx\nr3+dx/Tp0xk5ciR1dXVF19ma2icilililtJY6igSkX

blwQehe3eYMgUmToSjjqrj3HOHU1NTQ3V1\nNTU1NQwfPrxRnUUililiJtnTqKKkwI50

mp5LaB2tfcpk+HQYPg5JPh2mvhjjtgnXVgwoQJ1NTU\nLJxuVlVVRU1NDRMmTCiq/n

K3T0REREREpBTUUSQiFe2bb+C882DbbcNUs0mT4Be/WLR+wIABS+Qk\nqqqqqYsC

AAS0cqYililiSPIZe3tVvJl5e2uzSHv1yCNw/PGw+eYwahSst165l2q7zAx3t3LHISli\nliliz

assbz0TEWIO774LQ4fCyy/DIVdC//7ljkhERERERKRt0NSzCIPJeVlquW2g9pXCvHlw0

UWw\n9dawxRbw6qst10IU6edPRERERETaB40oEpGK8M9/wnHHwYYbwgsvwAYbID

siERERERGRtkc5ikSk\nTXv/fTjppNA5dMUVsPvuYMqkU3LKUSQiili0j5o6pmItEnffQd/

+ANsuSVsvDFMngyDBqmTSERE\nREREpCnUUVRhKjIPSiW3DdS+YowfD1ttBY89Bs

88A+edB8stV7LqG6XSz5+lililiLQPylEkIm3G\nRx/BKafAU0/B5ZfDXntpBJGiliFGZmX

YFICc/AHYDc/0V+7e4fly0wyUvnq7yUo0hEWr3582H0\nnaDj/fDjySDjrLFh++XJH1b4oR

5GISNOY2S7Ab4BfAF2Ax4B33X1wkfvscqzp7v8sfZTNrzXGb2b9\nngf2BqUB34FF3v6

UU2xUqY2adgV8DqxMeiLcExrn7NQ3stydwtrsPLHJfOwA3AM8AnwJdgY2Blle4+\nKV

GuA3AssBXwPuDATE4+vcI27wNsD3wDrAr8193/WEwZM+sEHA+sDawHrAlc6e63FV

nPOcDZeQ8o\nXO/ug7Men8Yws/0Ad/c7mlhP2a7VWCbLtVGK834OBc5XnjbWd19kib

nBMqW6T7PUU8Q1X7BdTaER\nRSLSqk2YAMceC6uuGkYSbbppuSMSEREpnrs/Djx

uZq8DL7r7bo2s6hLgHaDVdLQUqVXFb2Y/BcYA\nG7I7nZktD7xmZl+5+91N2S5j3RcA

PwN6u/t3ZvYT4AUz6+LuF+fZ73LALYQHw2LbsRSwPLAn8B3h\nHPza3d9I7eZPQJ27

/79Y9yvAJsB+RbS9P9DN3U9OxHi1mQ129+uylgFGALe4++tx/UDgfjNb1d2v\nKqKebs

BBhl6JBYSH6o7A6cCwlo9PYyzb1ApawbUKha+NUp33LOcr2ca890WWmDOWKcl9m

rGegtd8\nEe1qNOUoqjCVnCelktsGal/azJlwxBHwq1/BGwfAP/7RujuJKv38iYhI05nZ2s

BGwD8auf1SQG/g\niVLG1VJaafwjgHvcvQ7A3b8C/gacVYLtspRZijCilvcF/pT4e4d69js

MeltF03CK2ZcDp7t7lbuv\n5u77pztBzGxvwqi35MP4w8C9Re7rSOC5Vlyjgd2zljGzLsD

JwNCFDXB/EhgJOKflfc1099vc/R53\nv8/d7yeMmjnF3efkqqfA8Smzsl6rGa+NJp/3KMv

5Ssp7X2SJOWO7SnWfNIhP1ms+Y8xNoo4iEWIV\nvv8errkGNt8cVlkFpk4NnUXKRSQi

IhVgx/j7yUZuvyVhOsxTpQmnxbWq+M1sGaAf8Gpq1avAlma2\nSmO3y1q3u//W3Tdw9

6/j+h/F3xPy7HcX4GXg49TyYtpR6P+oTiVMhVmQW+Dup7r734rc1zxglJmt\nliizFTAx8b

IQmQXAh4SpmklvAysItsuyr0uTFZhZL2A5dx+fqrV/h9na7hWKXBtRKU475D9fNV7\nX

xQRc8EypbhPM9aT9ZrP0q4m0dSzCtO3b99yh9BsKrltoPYBPP98mGa2wgrwxBOhs6it  
qPTzJylilnJbEjMIfw7TBmdgLhW/J5hG/0f014UOgJ3OXut8dyewG/JHS0fAJcbmZz3P2  
4XMUX98UwYGVgJrAO\nYXTE52Z2CrB+XPY3wtSHbYBnUtM/Dorr/keYgvOluz+dof7  
Bwl8JlzuAw4jJJ/dBDiK8BDaYPxlnsj7heSg9QmFOYv2njdzuy0bWfRrwCEs+KK8E9H  
H3M81szya0Y2MzuxT4gjC67YHEdbYK8BPgUTM7\nGliF8CA73t1vLHJffwBqCdOXtG  
XeAHYCkrllGiwTR7VssMQRgg2BzxJtKrgvd/8i97eZdQTOBfbI\nU3e9x6eJjHB/NFZZr1  
UL39gWujagBOcdsp+vhu6LLNdzxms+n8bcpwXryXLNNyHmoqijSETKYty4\ncfTu3Zuq  
qipmzYLTT4cHH1zAQQdNYuTIHhpBJClilagf8LS7L7CQ1Pkz4CpgEvAtMNzdvzWzPY  
A\nA7cDxBwhd5vZvYSHgeOTlcbpCk8CY919aFy2F9DPzKYROmduJ+QGmunuvzazzx  
wl5QLDwFHgjsBxw\nYlzcCUIn1tMF6n+BMEvhAuA9whuJTo1IrgUudPejG4q/jFaOv79  
KLF8y/s47SiPjdksXU7eZHqV8\nEFgGONTd56W2O5VwjBsbT85mwF7u7vG8TjOzb93  
9XkKngQEDgf9z90/IdMHJZraMh4S7mfbl7i+Z\n2W7AA8D1hNEVu7j7/NwGWcqkmdk  
WhNEnQ3OjKRpRz28I1+E3edY1dHwyMbNbWfLaWSuu2z+1fJa7\nH5Kh2tZwrRa6Np  
rrvDd0vhq6L7Jcz1nKLNTEx+7SYepJIF7vmzayomBtLU88qTCXnSanktkH7a1/v\n3r054  
4wzGTVqlt27Q4cO3zJgwKmceWZ1m+wkqvTzJyliTWNmPySMwsINO+sJjAN6EDqM

znP3b+O6\nVQgji5LbdwD6AEtMvSB8Q9/F3S+NZdcABhHygKwE3E0YQTQXOBHA3

Xdx94Pj9r+N5X+dmMrwH+DK\nDPVvH9uxaaz/jERccwidY4XiL8jMxpjZwxI//pKx2tyD6f

ep5bkH5/q+VM+yXVF1u/s1cXTXpcCb\ncfoKsDAfy aPJURYsPjol677+AxzmHI4BHesb

D5wf1+eeDV93909imQWE nFrnmtnSWfcVR1YcTRhd\ndgGhw+JFMxuUaFfBMknxYfg

q4E53v7lx9cQ6TiK8dTCt0PHJxN0Pdvfdkj+Ee+jS9PKMnURQ/ms1ny7VR8vPe0PnKc

F9kiTITuxZW3rT7NFM9edqfvuaLirmxyjaiyMx2BUYRhqXe4PmzhV8J7Eb4j87h\n7j4xs

a4DYdjue+6eS3g2ktCzNo+QPOold/+8udsilsV7660qXnhhFHff/S433dSZceNquOiiGqq

q\nqsodmoiSHPI5Sd6AsDdxwCYWT/g8dT/s/YjTM1I2oY8+X3MrCtwKFAbp3F0Ik ybOc

ndPwM+Suzn\nX3FqQ3L7pYHfEV6rnBtBgLufkrH+u2K5/xfrT44K+DGLpq/kjT8rdz+sMd

sVMDP+Tn95nssPUteE\n7RpVt7tPMLMp wG1mti7hmG3m7uelia/Vsu0r9QDbM5cYD

MzqwJmxWVvp8rUETovN8+yrzhC7R5g\nhlecMveZ2V8Jb9W6yczWlo yga6jM2r4oj0v

ORYRpSkflFmTYV7qevoSRHJPTB6LQ8fGY6LkJmvJV\naLmv1YLXhpINpPTnvS95zf

srC50X2S5nrOU+U9qXWPv0yWk63H3uakiS1zzjY25WG XpKlqdPFcD\nOxNeGfeimd3

v7IMTZfoDG7r7Rma2HfBHoFeimhMJWcKTiZ4eA06LQ7lulrw+73fN25rWpZLzpFRy\n2

6D9tG/2bBg+HO6+Gy68sCN9+izFD3+4FtOnT2/TnUSVfv5ERKTJdgQ+c/f/ppb3AxZ+Y

WohF9BA\nwnnSL9Pavu/vM1PKNCd/8X+zuDSXJ7gf8Nc/yTYDVgMfr2S5r/T8n8a1/7ID

6GeH/4RuKv5w+IHQE\ndEstz021qe+NV1m2+7xQGTP7AfBv4EF3T+ZweYcwUqs7sA

WwqZndlFjfD1g6LruPMKKr0L66EKY4\n3uPuJyXKrEgY9fAdITfV1zQ8OiVL2zcFunoi8b

C7TzWznYHpsV1fFyizWTw2AJjZb4EvfNG0xnUJ\nnnaAbFIMP4U1Rc9OdUBmPTzmV9

VoldEIUujZKft6p53wB/SI8XzyYleaC13yJ7tP7gWcL1LMZMX8d\nNHjNZ7IPm6xcI4p6A

tPcfQaAmY0IJKeamigziNCziLs/b2ZVZtbN3T+28GrR/kANYSgasVzyP3DP\nA3s3aytEJ

LMFC2DMmJCLaK+9YMoUWGqpOoYPH8n06dMZOXIkNTUaUSQilhWrH6lpV2a2HID

N4m9B\n25PwUHqfhTxAk9x9GqGjZXzcbmlgmLvXEEb3QHhTzmLMbBN3f83Cm3K6k

/9ta7IRBP/Ls/3GGevv\nBGzH4tPO9oh1j46f64s/EzMba6yesfgn7n5ooULuPs9CrqbNU

qu2ASbmpnU0drxCZSzkhImDRXIkkncroRroHp7v4iIX/UQmb2ZAjDj0gsK7Sv5Qn5UF5

PldkYeD430szMHgPWS5VZg5AoebK7f59hX6sQ\n8l0txt3nmNm7hIECVRnK5Np2ILAg

NVrjaOBswhTNTPUk4sw3cmgBGY5PuZT7Wo1IGrw2CMm/S3be\nEzEscb48JG3Ocl9

kuZ4Ltas7JbhPM9zvMxLb1nfNn5Ux5qZz9xb/AfYBrk98Phi4KIXmAeCnic/\nALaOf99B

SOjUh5CJPt8+HiAk40sv90r25JNPJuEZIPJbXOv7PZNnOjevfut3rOn+0svhWWzz8/2\n

Y4891mfPnp33c1tTyeFP3T3+21mW/2boRz/60U9b/yFMBVgAHJ9afgTwfmrZlcA1hCkL

FyeWTwKG\nxL+HAesl1v0b2DfxuRNwJrBz/LwvYQrYUnliWwp4Ddgztey3wKCM9W8X  
27d7/LwKYVrElVniL/O5\n2ZUw9WbF+HIVQs6oPRJldiMkBN+5yO2ylHKY+HHi83qE6T  
kXNhDz08BTjWjHBcBGic89CSNJtkks\n25qQXHiV+HklwsP74CL39QBwXCrGXwKjiizz  
f4QBAKcRZor8jjBr5KFi6kksfwV4p57jWvD4NOE6\nO5yQ/6gtX6tZro2SnPcs5yvjfZEI5ix  
ISnWfFqwn4zVfMOam/pRrRFHWVwOm5/SZmQ0kvK1hopn1\nzbuR2XBgnrv/rQkxikg  
Tff45nH02jB0LhxwCl1wCS8XvLSdMmLDYCKKqqipqamqYMGECAwYMGPU\nlilipW  
FmPQkdLlsT/v/3EDP7CSGP5gLCa5DT08HGEh4KaoA/JZafDxwURwc95u7vJNbtDVx  
sZt0J\n0w6WBsa4+1txfTXhjWWLJciGkAQ1/v/1+Wa2Zdy+Uyz/Wsb6f07lqbSFmW1FG  
IVxjLs/mjH+snH3\nR2LupevN7GVgS+AEd78vVbQjidkYWbbLWPd+wBlmlpvitAHhfqG  
dKxm9kvCqlJegJvZo8C17n5P\nxn2dE/fVjfBwujqwvbu/nlj5P2Z2WKznXcLbun7n7rcU2  
a594r5ulYxyWI6QNmRo1jJxZNKdcfm2\nqcNxb9Z6UqaTShRfzPHJls6WSb+Fbl247uD  
U8k/c/cAs9Zb7Ws1ybVCC857S0PkCCt4XWa7nLO0q\nyX1aqJ6s13zGmJvEYg9UizK  
zXsA57r5r/Hw6YWhVcn72tUCtu4+Nn18jJLM6ATiE8B+pzoR5o3d5\nHF5qZocT5nTv5  
HleoWdmfhh1FdXQ2Eh9MePXoszC+Se3ORPuuzPjf+c58+ffnrX+HEE2vZfnu4\n+ea  
+rLpq64IPnwt/rq2t5eabbwagurqac889F3dvg++jExGR5mZm9wGvuvwsciliJV66Oo

o6E\n+Z87ERJsvQAc4Esmsx7i7v1jx9lod++VqqcPcloveuvZroRXD/Zx91nkYWZejaLtB  
evvgrHHQdf\ngnXXAPbbVfuiKQUzEwdRSlisgQzM8JULyPc/YFyxyMilk2XfgVei/Dw2sw  
hwKOEWa3e8h2PtjM\nBscyDwFvm9k04Drg2PqqS/x9FbAC8LiZTTsza5qtEa1UbkR  
AJarktkHbb98XX8DJJ0O/fvCrX8EL\nLyeSdTW21dlpbdPRESkHpsTkrO+UO5ARESK  
NDLnKDKzzYEDgB/H7ZYjzBf8gpBs6Y58857r4+4P\nE5I5JZddl/o8pEAd40m8PcLdN8  
q6fxEpDXe4/XY45RTYZReYPBIWz/pOEhEREWmzzGwf4FzCF7fX\nnm9mZ7j6pzGGJi  
EgTZZp6ZmY7E16XNy6RtC63zoAtCNPI/lssq+WpqInIqUzdSoMGQKzZsHo0fCz\nnn5U  
7lmkumnomliliIt+FUnoMrPOwNruPq1gZWbd3X1yqYJrDuooEmm6r76C886DG26As8  
4KOYk6\nlusditli1FEkliliIt+FMxR5O7f1NdJZGZbxBFFubKtupOoPajkPCItrW3jxo2jrq5u  
sWV1dXWM\nGzcub/m20D53uOsu2HRTeO89eOUVOPHEbJ1EbaF9TVHp7RMRE  
Rkfah6GTWZnaomY2Kr6H/ipC3\nSERSevfuzfDhwxd2FtXV1TF8+HB69+5d5sga5803  
YbfdYMQIuOUWuPVWWGONckclililipZQp\nR9FiG5gdCjwl9AIGAR+6+7nNEFuz0N  
QzaUm5zqFhw4YxcuRlampqqKqqKndYRZk7Fy68EP74Rzj9\nndDjhBOjUqdxRSUvT1D  
MREERERkfahMR1F/YGn3P3L5gmpeamjSFrajBkzWH/99Zk+fTrV1dXIDqco\n998fppZtt  
x384Q+w1rljkjKRR1FlililiLtQ9FTz4BdgQfN7C4zO83MepY6KGm8Ss6T0hbbVldX\nnx8i

RI5k+fTojR45cImdRUmtq39tvw+67w6mnwvXXw9ixTe8kak3taw6V3j4REREREWkfGt

NRVOvu\nfYFDgGeBn5Q0IpEKkZt2VINTQ3V1NTU1NYvILCqHQgm2v/kGzj0XevaE3r

1h0iTYeedyRCoilili\nliLI0JipZ78E3nP3F5snpOalqWfSUsaNG0fv3r0Xy0lUV1fHhAkTG

DBgQFliSnZeVVVLfb5mWeq\nOP546NEDLr8c1I23LCFKK6WpZylili7UNjOopGxT9/

CHwDjHf3q0sdWHNRR5G0d+kE24MHX8Cl\nEV159VW46irYdddYRyitkTqKRERERE

Tah8ZMPbsLuNPddwcOBZ4rbUjSFJWcJ6WS2wYt176qqiqG\nDRvG+uv/iOWWO59+/

bqy9dbwyivN20mk8ycililiL6dSxUwMyWAbq4+ywAd386t87dvwZeSpRd\n193fbY5AR

aQ06urqOOGEB1h//S+5886pPPFEB7bccsVyhyUiililiKtQKapZ2Y2EFgRuCd2DqXX\nr

wTsC0xNdiS1Rpp6Ju3Z5Mmfs8cebzF//pZcdVUHfv7zxXMWidRHU89ERERERNqHzD

mKzGwN4Ahg\ndaAz0An4HpgLvAdc7+6fN1OcJaOOImmP5s2DK66A88+fx9FHL+Ccc

zqz7LJhXbkTbEvbol4iERER\nEZH2oehk1m1dpXcU1dbW0rdv33KH0SwquW3QfO178

kk47jhYb72QrHrDDUu+i0x0/to2dRSJilil\niLQPBMUiUjb9OGHcPLJMGEcjBoFe+4Jp

sd8ERERERERaYBGFIUmPnzw8ihmho46igYPhyWX77ch\nUUlbpxFFililiLtg0YUiVSQ

p58O08y6dQsjiX70o3JHJCililiim3JUsUUNrP9zGzF+PdZZnaP\nnmW3dPKFJY9TW1p

Y7hGZTyW2DprXv44/hsMPgwAPhzDPhscdaXyeRzp+lililiEjrV1RHEXCWu88x\nns58B

OwE3An8sdqdmtquZvWZmb5rZafWUuTKuf9nMtkqt62BmE83sgcSylc3scTN7w8weMz  
O961sq\n3vz5cPXVsPnmsPrqMGUK7LefchGJilililhI4xSVo8jM/uvuPczsluAVd/+rmU10  
960Kbryojf7A\n68DOwPvAi8AB7j41UaY/MMTd+5vZdsAV7t4rsf4kYBugi7sPissuAWa5  
+yWx82kld/9dnv0rR5FU\nhGefhWOPha5dYfRo6N693BFJJVOOIhERERGR9qHYEUX  
vm9mfgF8BD5lZ50bU0ROY5u4z3P07YCyw\nR6rMIGAMgLs/D1SZWTcAM1sb6A/cAF  
i+beLvPYuMS6RN+OQTOPJI2GcfGDYMnnxSnUQilililiJS\nGsV28uwLPAL8wt1nAysB  
w4qsYy3gf4nP78VIWctcHve5lVNN3f/OP79MdCtyLgqQiXnSanktkHh\n9n3/PVx3Xeg  
UWnHFMM3swAPbjSz9n7+RERERERE2oJi33qW6xT6sS16OnXgsSLqyDrvK/34a2Y  
2\nEJjp7hPNrG+9O3B3M9P8MqkYL74YppI17gz/+AdssUW5lxIREREREZFKVGxH0Vc  
s6uhZFhgITCmy\njveBdRKf1yGMGGqozNpx2d7AoJjDqDOwopn9xd0PBT42sx+4+0d  
mtgYws74ADj/8cKqrqwGoqqqi\nR48e9O3bF1g0KqCtfs4tay3xIPJz3759W1U8LdG+++  
+v5YYb4MUX+3LRRbDuurV89hIA+eMtRfsq\n6XOlta+2tpabb74ZYOG/lililiUvmKSma  
9xMZmywCPuXuflrbpSEhmvRPwAfACDSez7gWMSiaz\njmX6AKe4++7x8yXAp+5+sZ  
n9DqhSMmpqxysgJtuguHDQy6i88+HKr3HT8plyaxFRERERNqHYnMU\nnpS3PkvmFG  
uTu84EhwKOE0Ui3u/tUMxtsZoNjmYeAt81sGnAdcGx91SX+vgjYxczeAHaMn9ud3liA\

nSITJbYNF7Zs4EXr3huuvh4cegquvroxOovZy/kRERERERNqyoqaemdkiY9LAasDvy9

2p+7+MPBw\naiFuLkAACAAASURBVNI1qc9DCtQxHhif+PwZsHOxsYi0FI9+CccfD3//O

1xwARxxBCzV1K5cERER\nERERkSIUnfXMzKoTH+cDH8dX3LcZmnomrY073HILnH

YaDBoUOolWWaXcUYksTIPPRERERETah6JG\nFLn7jGaKQ6RdeuWV8Dazr7+G++6

Dnj3LHZGlilili0Z5kmtpjZhPj7SzP7lvUzp3lDIGJUcp6U\nSmrbnDkwdCjstBMcdBA8/zz

MnVtb7rCaVSWdv3wqvX0ilililtl+ZOoocvfe8fcK7t4l9bNi84Yo\nUjnc4W9/g003DZ1Fkyf

D0UdDhw7ljkxEREREREQKY44iMzs5/pm3sLtfVsqqmpNyFEm5TJkCQ4bA\n7NkwejT

89KfljkgkO+UoEhERERH5/+3deZyWZb348c9XCHcdzSU99gstLXE BXEjDEIOPJB6Xji

16\ncsmOuZNWbpBIGaKgRu5LKtqGluVxQU3JwSRFNBEVMBfUcEFEcANF4Pv747m

hYZiBmWFmnnme+bxflnr/v1mvt+ruu6v9f94PSab9f1vTuHpr5TaW1gLWAn4DjgP4Dni

p93aJvQpOrw3ntw2mmw++7w1a/C\nhAkmiSRJkiRJHVNTt56dnZk/BT4J7JCZP8jM71

NKEn2qLQNU81RznZRKm1sm/OEPpW1mr78OTz1V\nWHUtZES8pU2v+ZyfpIkSZLU

8TXrrWfARsBHdc4/Kq5JquOZZ+Ckk+C11+C3v4UvfancEUmSJEmS\ntGJNqlG0pHHE

YOAbwJ+AAA4EbsrMc9smvNZnjaLqcuedd9K3b19qamqWXJsZw7jxo1jwlAB7R7P\n

++/DuefCVVfB4MGIFUQf+1i7hyG1OmsUSZIkSZ1DU2sUAZCZQ4BvA3OAt4AjKylJpO

rTt29fBg8e\ nzJw5c4BSkmjw4MH07du3XePlhFtvhW22gWnTYNIkOOUUk0SSJEmSp  
MrSrEQRQGY+IpkjMvOXmfI4\nWwSllqvmOikNza2mpoYhQ4YwePBgXnzxRQYPHsy  
QIUOWWmHU1p5/HgYMgDPPhOuug9/9DjbdtPnj\nVPN3B85PkjRJkipBc2sUERHrA5  
8BVlt8LTMfaM2gpOaoqanh1FNPZfPNN2fatGntliSaNw/OO6/0\nqvTTiutKOrWrV1uLU  
mSJElSm2hujaKjgYGu3n72OLAL8FBmfrtwmt91iqPou3m5166qkMHz68\nXVYU3XE  
HDbwIO+4IF10En/xkm95OKjtrFEmSJEmdQ3MTRU8BO1NKDvWKiM8BQzPzoLYKsL  
WZKKou\ni5NEi5ND9c9b27RpcPLJMGUKXHop/Od/tvotpA7JRJEksZLUOTS3RtEHm  
TkPICJWy8ypwGdbPyy1\nVDXXSWlobuPGjVsqKbS4ZtG4ceNa9d4ffgg//znsvDN8/vP  
w5JOtnySq5u8OnJ8kSZIkVYLm1ii\nHhHrAbcC90bEbODFVo9KaqlBAwYsc62mpqbB  
6y11zz1w0kmlN5o9+ih0795qQ0uSJEms1KE0a+vZ\nUh0j+gHrADWZeWNrBtWW3Hq  
mpvrXv0qvuh/8cbj44tKbzaTOyq1nkiRJuufQpK1nEbFWRPwgli6P\niOMjYhVgPeA84  
OA2jVBqZ/Pnw/hnQ+/esN128NRTJokkSZIkSZ1DU2sU3QhsB0wC9gQeBk4BDs3M\n/dsoNrVANddJaY+5jRkDPXvCAw/A+PHwk5/A6qu3+W2B6v7uwPIJkiRJUiVoa02iz2Tm  
9gARcQ3w\nGvCpxYWtmysi+gMjgC7ArzLz/AbaXAx8BZgLHJmZj0fEasBYYFWgG/B/  
mXlm0b4PcCnwMWABcHxm\nTmhJfOp8XnkFfvADePhh+OUvYf/9Idxkl0mSJEaqZJp

UoygiHs/M3o2dN+uGEV2AZ4C9gFeACcAh\nmTmlTpt9gRMzc9+l+Dzwy8zcpfhsjcycG  
xFdgQeBH2TmulioBYZm5j0R8RXgtMzco4H7W6NIS3z0\nUan+0NChcOyxMGgQrLFG  
uaOSOh5rFEmSJEmdQ1NXFG0fEe/WOV+9znIm5jrNuGcf4LnMfBEglkYB\nBwBT6rT  
ZH7ihGHx8RNRExMaZOSMz5xZtulFakTS7OH8NWlf4uYZSEkpq1NixcMIJsOmm8Pe  
/w1Zb\nlTsiSZIkSZLKq0k1ijKzS2auXefoWufn5iSJAP4D+Fed8+nFtRW12QxKK5liYilw  
A7g/MycXbc4A\nLoylI4HhwJnNjKsqVHOdlNaa2+uvw2GHwbe+BWefDffc0zGSRNX83  
YHzkyRJkqRK0NQVRa2pqfu+\n6m9xSIDMXAj0ioh1gXsiol9m1gLXAgMz888R8TXgO  
mDvhgY+8sgj6d69OwA1NTX06tWLfv36Af/+nY69SzydOnNih4ull5wsWwCmn1HLjjXD  
ccf2YMgUefbSWsWM7Rnyee96Rzmtraxk5ciTAkt+XkiRJ\nkqpfk2oUteoNI3YBzs7M/sX  
5mcCiugWtl+JKoDYzRxXnU4HdM3NGvbHOAuZm5oUR8c7i1U0REcCc\nzFyXeqxR1  
Dn9/e9w/PGw/vpw2WWw9dbljkqLNyokiRJkjHjm09a2WPAltGRPeI6AZ8A7itXpvb\n  
gMNhSWJpTmbOilgNIqKmuL46pRVDE4s+z0XE7sXPXwb+2cbzUAV44w046ij4+tfhjD  
NgzBiTRJlk\nSZIkNabdE0WZuQA4EbgHmAzclJITluKYiDimaDMaeCEingOuAo4vum8  
C/LWoUTQeuD0zxxSffRcY\nVnz28+K801m8daQaNWduCxfCFVfAttvCeuvB5MnwzW  
927FfeV/N3B85PkjRjkpBOWoUkZl3AXfV\nnu3ZVvfMTG+j3JLBDI2M+Cny+FcNUhXrk

kdl2szXWKK0g2m67ckckSZIkSVJlaPcaReVmjaLqNWsWlnnHkm3H47DBtWeqtZR15  
BJFUSaxRJkiRJnUM5ahRJrWrRlrmGujRA1ZbDaZMgcMOM0kkSZIkSVJz\nmSiqMtV  
cJ6WhuT32GOy6K1x/PdxzD1x8MdTUtH9sraGavztwfplkSZJUCUwUqSLNng0nnAAD  
BsAx\lx8CDD0KvXuWOSplkSZKkymaNIIWURYvgxhtLr7o/6CAYMgTWX7/cUUnVzxp  
FkiRJUudQlreeSS3x\lxBOIVUTz58Mdd8BOO5U7IkmsJEmSqotbz6pMNdZJefttOPlk6  
NevlzMPh4cfrs4kUTV+d3U5P0mS\lJEnq+EwUqcPKhN/+FrbeGt5/H0aOhO9+F1bxX6  
0kSZIkSW3CGkXqkJ5+urTN7J134PLLYZddyh2R\l1LIZo0iSJEnqHFyboQ7I3Xfhhz+Ef  
v3ga1+DCRNMEkmSJEms1F5MFFWZSq2Tkgk33VTaZvbmm/9e\lUDsly7/bVOrcmsr  
5VbZqn58kSZKkzsG3nqnspk6FE0+EmTNh1CjYbbdyRyRJkiRJUudkjSKVzfvv\lw89/D  
r/6FfzoR6UVRF1NXUodkjWKJEmSpM7BrWdqd5nwpz9Bjx7w8sswaRJ873smiSRJkiR  
JKjcT\lRVWmo9dJefZZ+MpX4Kyz4lYb4Le/hU02aVrfjj63leX8Klu1z0+SJEIS52CiSO1i  
7txScmjXXWGv\lvWDixNKbzSRJkiRJUsdhjSK1udtvh4EDoU8fuPBC2GyzckckqbmsU  
SRJkiR1DlaFUZuZNq2UIHr2\lWbjmmtJKIkmsJEmS1HG59azKdIQ6KR98AD/7Gey8  
M3zhC/DEE62TJOolc2tLzq+yVfv8JEmSJHUO\lZUKURUT/iJgaEc9GxOmNtLm4+PyJi  
OhdXFstlsZHxMSImBwRQ+v1OSkipkTEUxFxfnvMRUu76y7Y\ndttSDaJ//APOPBNWX

bXcUUmSJEEmSpKZo9xpFEdEFeAbYC3gFmAAckpIT6rTZFzgxM/eNiM8Dv8zM\nXYrP  
1sjMuRHRFXgQ+GFmPhgRewCDgH0z86OI2DAzZzZwf2sUtYGXXoKTT4Ynn4RLLim  
92UxS9bBG\nkSRJktQ5IGNFUR/gucx8MTM/AkYBB9Rrsz9wA0BmjgdqlmLj4nxu0aYb  
0AV4qzg/DhhajEIDSSK1\nvg8/hHPPhR12KB1PPWWSSJlKSZKkSIWORNF/AP+qcz6  
9uLaiNptBaUVSREwEZgD3Z+bkos2WwJci\n4uGlql2Indok+g6uPeuk3HcfbL89PPQQT  
JgAZ50Fq63Wdver9howzq+yVfv8JEmSJHUO5XjrWVP3\nfdXf4pAAmbkQ6BUR6wL3  
RES/zKyINJf1MnOXiNgZuBnYoqGBjzzySLp37w5ATU0NvXr1oi+/fsC\n/9ir1POJEye26  
nhDhw5lu+22Y7/99lvY+bRp73HddTswffqmHH10LV/4AmyxRceYv+eee94657W1\nntYw  
cORJgye9LSZIkSdWvHDWKdgHOzsZ+xfmZwKLMLP9OmyuB2swcVZxPBXbPzBn1xj  
oLmJeZF0TE\nXcB5mTm2+Ow54POZOateH2sUNcOcOXMYPHgwQ4YMYc01axg6d  
B5Dhy7kpJO6cvbZq7HGGuWOUFJ7\nsEaRJEmS1DmUY+vZo8CWEdE9IroB3wBuq9  
fmNuBwWJJYmpOZMyJig4ioKa6vDuvNPF70uRX4cvHZ\nVkC3+KKiNV9NTQ1DhgzhY  
CNHss0287n22hcYN24Rw4aZJJIkSZIkqdq0e6loMxcAJwL3AJOBmzJz\nSkQcExHHF  
G1GAy8Uq4KuAo4vum8C/LWoUTQeuD0zxxSfXQdsERFPAr+nSDR1Nou3jrSW116D  
E06o\nYcKEE3n22W9QW7smO+ywTqveo6iae24djfOrbNU+P0mSJEmdQzlWFJGZd2

XmZzPzM5k5tLh2VWZe\nVafNicXnPTPzH8W1JzNzh8zslZnbZ+bwOu0/yszDMnO7zN

yxqFukFlqwAEaMKBWr3njjDxgw4FSm\nTfsFF1wwnDlz5pQ7PEmSJEms1AbavUZRu

VmjAMUefBCOPx422gjOPfcdbrijhTIYMGUJNTc1SNYtq\namrKHaqkdmKNlkmSJklzM

FGkJWbMgNNPL732/qKL4Gtf9Gj76Rv375LJYXmzJnDuHHjGDBgQBmj\nldSeTBRJk

iRJnUNZtp6p7bSkTsChXDppbDttrDhhjBICnz96xABAwYMWGbIUE1NTVmSRNvA8

b5\nVbZqn58kSZKkzqFruQNQeT38cGmb2TrQG0tbLNNuSOSJEmSJEml4tazTurNN+

GMM2D0aBg+HA49\nLSCSJla4tYzSZlkqXNw61kns3AhXHUV9OgBa61V2mb2P/9jkk

iSJEmsJJkoqjrLq5Py6KOw667w\n61/DvffCiBGw7rrtF9vKqvYaMM6vsIX7/CRJkiR1Dia

KOoG33oLjjoP/+i844QR44AHo2bPcUUmS\nJEmSpI7GGkVVbNEiGDkSBg2Cgw+Gc

86B9dYrd1SSKpE1iiRJkqTOwbeeVamJE0tvM1u0qFSweocd\nyh2RJEmSJEaq6Nx6V

mXuuKOWgQNhn33gqKPg73+vniRRtdeAcX6VrdrnJ0mSJklzcEVRIciE3/wG\nTj65tM1

s8mT4+MfLHVXnNhr0aEaNGsXWW2/N008/zT777MNhhx22wn4PP/ww11133XL7rWj

sjz76\niEsuuYTp06fz0ksv8eqrrzJw4EAOOeSQRu/7yCOP8LOf/Yw77rij5ZMu05Y+76b

0W1GbDz74gF/9\n6le88cYbPP/88wwfPpwBAwZw/PHHN3rfSn/ekiRJkqpcZnaqozTl6J

pUuZuu2XuuGPm+PHljqZz\nGzduXG6wwQY5e/bszMx87733crPNNSTbbriIpf1pc3gw

YNz6tSpS85vv/32jli8+OKLG7zv+++/nn1tttVXuscceLZvwSrjjjjvyzjvvXKkxyv28TznINx5  
551z/vz5mZk5YcKEjlg877zzGrxvOZ/3\yip+d5b9d7iHh4eHh4eHh4eHR9sebj2rYO+8A  
9//Puy5Jxx6KlwfD336IDuqzu2nP/0pBx10EDU1\nNQCsueaaHHrooZxzzjkr3W9Fbd599  
10uvPBCfvGLXyzps99++7HTTjtx9tlnN3jf4cOH8+IPf5rM\n9i/w/uabbzJz5syVGqOczxtg  
0aJFvPnmmyxYsACAHj16APDAAw80eN9yPm9JkiRJagoTRRUoE37\nne9h6a5gzB55  
+Go47Drp0qe46KR19bh9++CH3338/22677VLXt912W5544glmzZq13H6rrrpqo/2a\nMv  
Yqq6zCJptswrvvrtUmy222ILZs2cvk5S599576dmzJxtvvHFLp9wsrf39rezzXI6/po49Ys  
QI\nXnjhBVZffXVqa2t55pInAOjb+8y923v5y1JkiRJLWGiqMJMnIxaQXT++fCHP8B118  
GGG5Y7qvZ1\n1113cc4559C/f/+lkgG33HILe++9d9nimjZtGgsWLGCdddZZ6vri82nTpi  
2335prrtlov6aMveaa\na/LCCy/w29/+dqk2zz33HOuvvz4fr1O0avbs2YwdO5YDDzyw0d  
UtV199Neeeey6HH3449913H9de\ney1Dhw7I0EMPZfr06St6HG1uZZ/38vq1dOzzzz+f/  
v3788Mf/nCp60153plksZLUEZgoqhDvvQen\nnw677w4HHQSPPgpf+MKy7fr169fusb  
WXfv36MWvWLB577DHOussXnrpJf72t78t+fzmm28u62qN\nnt956C2CZhM9aa60FOO  
gKI8X9dtxxx0b7tXTsSZMm8fjj/PjH/+YVVb593/uw4YN4/TTT290Ltdc\nncw29e/dm0KBB  
nHTSSRx88MF8/OMfZ6eddmLUqFE8/fTTjfZtTGv/21zZ5728fs0d+/LLL+f222/n\nww8/5

MYbb6Rbt25Lfb6i5y1JkiRJHYVvPevgMuGWW0q1iPr1gyefhE98otxRlc99993HYYcdxq  
RJ\nk3j22WfpU6co0wMPPNBoLZ6GHHHEbzxhtNarvhhty4403LrdN166I/5y6dOmy  
1PX58+cDLKlj\n05J+LRI70aJFS5I8AwcOXHL9lItuYZ999mHttddci0iluo7a9Ysdt55Zw  
BeeukIVIIIFQ488EDm\nzZvH2LFj+eIXv9jgXJojM5e5b3N0pOe9+C1n48aN8stt+Tmm  
29esrqtKc9bkiRJkjqKsiSKlql\nnMALoAvwqM89voM3FwFeAucCRmfI4RKwGjAVWBbo  
B/5eZZ9br9wNgOLBBZr7VtjNpW//8J5x0Erzy\nCvzmN/CIL624T21tbdWuKqqtreUb3/g  
GACeffDJ77rknm266KQBTp05IxowZzUpg3HDDDa0a30Yb\nbQSUEjR1La4ZtLgocmP  
9nnzySb761a822K8lY59xxhlstdVWXH311Uuuvfbaa0yePJmzzjprqbb1\nnt0OdccYZS36  
ura1l9913B2D11VdvUZLoW9/6Fs8++yzrr7/+kmuvvPIKAKNGjVqq7QYbbMCvf/3r\nFY  
65ss97ef1aMvbi//Z69OjBlYccwssvv8zbb7/dpOctSZIkSR1FuyeKlqlLcCmwF/AKMCEib  
svM\nKXXa7At8JjO3jljPA1cAu2TmBxGxR2bOjYiuwlMRsVtmPlj0+ySwN/BSe8+rNc2d  
C+eeC1deCYMG\nIZJFH/tYuaPqWP74xz/yk5/8ZMn52LFjWX/99Ze8daocNt10U9ZYY  
w1mzJix1PXF25S22mqr5fZb\nnvN2poX7rrrtus8YeMWIEa6+9NsOGDQPg5Zdf5hOf+A  
SjR49mypQpfPvb317S9v7772f+/Pl8+9vf\nZv/99+eggw5aaqwxY8Zw7LHHNuKZNOY3  
v/nNMknMG264gYjg8MMPb9GYK/u8l9evKc/79ddfZ8cd\nnd2S//fbjqquuWtLmU5/6FA89

9BBPP/00kyZNavbzliRJkqRyKseKoj7Ac5n5IkBEjAIOAKbUabM\ncANAzo6PiJql2Dgz  
Z2Tm3KJNN0orkur+dX0RcBrwf207hbaRCbfdBt/7Huy6K0yaBMWcmSar1tVE\n8O+5v  
fXWW7z66qtLbTurra1lt912a9Z4rb31rFu3buy9995Mnjx5queuPPfYYvXv3ZsNGqo4v7ld/\n  
nO1P9fk0d+3e/+x2rrLLKUqtYrrzySn72s5/xne98h+985ztLjbHHNsQEvx//fUALFy4kL/+  
9a/s\nueeeevP766zzzDNLVhRBqd7Oaaedtxn0ZCG/m2uzMqalX3eK+q3ojaTJk3itdde  
W5LgWzy/GTNm\n8LGPfYzNN9+cnXfeeYXPW5IkSZl6IMxs1wM4GLimzvm3gEvqtbkd  
+EKd8/uAHYufuwATgXeBYXXa\nHAD8ovh5GrB+l/fPjui55zL33Tfzc5/LvO++ckfTsb377  
rvZrVu3nDhxYmZm/vOf/8x11103L7jg\ngjJHInnXXXflhtumG+//XZmZs6cOTPXW2+9v  
PXWW5e0GT16dG6wwQZ57733NqtfU9rcffd2adP\nnnzzvvPNy6NChOXTo0Dz33HPzK  
1/5SqMx77bbbvnFL35xyflI12WEZFTp07Niy66KNdcc82cOXNm\nZmbefvvtS91vZYwc  
OTJHjhy5UmOU+3n3798/J02atOT8xRdfzG7duuUZZ5zRaMz1n3eIKH53tvv\nZnh4eH  
h4eHh4eHh4tO9RjhVFTV1CUL/a6+lsz0KgV0SsC9wTEf2AR4BBIladNda/Q5o3r/Sq+0  
sv\nnhVNPhT//Geq9MKIZqr1GUb9+/VhrrbW4+uqrOe+88+jVqxfPP/8877zzTqsUWF5Z/f  
v3Z9iwYRx9\n9NH07NmTJ554gosvvpgDDjhgqXYLFixYagVR//79Oeqoo5bbb0Vjz5o1i  
4MPPpi5c+cyYcKEpe53\n4IEHLhPrn//8Z6688koefvhhl0J99tmHY489lr59+3LooYdy00

030bNnT6644gpOO+00unfvTvf\n3Vu8Vawt/m2uzPNeUb+mtLn55ps599xzeeddd3j11  
Vf58MMPueyyy/jf//3fZWJt7Hm79UySJEIS\nRxKZ7VtUNSJ2Ac7OzP7F+ZnAoqxT0Doi  
rgRqM3NUcT4V2D0zZ9Qb6yxgHnA3MIZS4WuAzSjVP+qT\nnmW/U65NHHHEE3bt3B0  
pFaXv16rXkD9ja2lqANj1/6KGHO644xg3roajj65lyy3hsst689JLDy55\nhXdLxx8xYkS7  
z6e9zhf/XP/z66+/hvvvppvXXnuNBx54oMPE21rzq5bz+vO76aabmDJICv369esQ\n8bX2  
/ModT2vMZ+TIkQB0796dn/70p2RmRSTgJUmSJLVcORJFXYFngD2BVymtBjokly1mf  
WJm7lsk\nlkZk5i4RsQGwIDPnRMTqwD3ATzNzTL17TKO0VW2Zt55FRLb3nOubNOK  
dDjxwGqussi2XXdaFz39+\nDoMHD2bIkCGNvqlJ//ajH/2IXXfdIQEDBrBo0SK23nprjjjiC  
AYNGITu0KSqFREmiiRJkqROYJX2\nvmFmLgBOpJTkmQzclJITluKYiDimaDMaeCEin  
gOuAo4vum8C/DUiJgLjgdvrJ4kW36at59ESH34I\nQ4bAl7+8Doceu hV77f\n9PvvZF00S  
NcPMmTMZNmzYkrdPXXjhXTv3p3TTz+9zJFJkiRJkIT52n1F\nUbmVa0XRX/4CJ54IP  
XrAiBHQvTu8+OKLbL755kybNm3JVriVVdsJahRdcsklzJs3jzfffJO11lqL\nQYMG0bVrO  
cptta5q/u7A+VU6VxRJkiRJnUPI/3Xdwf3rX3DKKfD443DxxTBgQOn6nDlzGD58ONOm\n  
nTWP48OGuKGqGk046qdwhSJlkSZJUIVxR1Ebmez4df/AKGDy+tJDr9dFh99dJnc+YsX  
ZOo/rkkdTsu\nKJlkSZl6BxNFbeCvfy0lhzbfvLSK6NOfxvrzO++8k759+y6VFJozZw7jxo

1jwOIIr5LUgZgokiRJ\nkjqHdi9mXc1efRUOOQSOOgqGDoU77lg2SQQwYMCAZVYO

1dTUtEqSqO4ruqtNNc8NnF+lq/b5SZIk\nSeocTBS1go8+gosugu23hy22gMmT4YADIP

z/3iVJkiRJuGvx69IKeuABOOEE2GQTuPRS2GqrVhta\nkjoMt55JkiRJnYNvPWuh11+H

U0+F2tpS0er//m9XEEmSJEmSpMrm1rNmWrAAkEttsONt0UpkyB\ngw/uOEmiaq6T

Us1zA+dX6ap9fpIkSZI6B1cUNcPf/17aZrbiejB2LPToUe6IJEmSJEmSWo81ippg\nh5kw

4/XS45x644AL45jc7zgoiSWoP1iiSJEmSOge3ni3HwoVwxRWwzTZQU1PaZnbISaJJE

mSJEmS\ndTJR1lgJE2CXXeD3v4cxY+Cii2Cddcod1YpVc52Uap4bOL9KV+3zkyRJktQ5

mCi9Z9YsOOYY2H9/\nGDiwVltou+3KHZUKSZIkSVLbs0ZRYdEiuO46GDwYvv51OOe

c0nYzSZI1iiRJkqTOwreeAf/4Bxx/\nfvKn20N13Q+/e5Y5IkjRJkiSp/XXqrWezZ5ded7/vvv

Dd78K4cZWfJKrmOinVPDdwfpWu2ucnSZIk\nqXPollmiRYtg5EjYeuvSz5Mnw1FHwSq

d8mllkiRJkiSVdMoaRX37Jh9+CJdfDjvvXO6IJKnjs0aR\nJEmS1DI0yhpFhx8O3/kOdOI

S7kgkSZIkSZI6jrJttoql/hExNSKejYjTG2lzcH5ExHRu7i2WkSM\nj4iJETE5lobWaT88Iq

YU7f8UEes2NO53v1u9SaJqrpNSzXMD51fpqn1+kiRJkjqHsiSKIqlLcChQ\nH+gBHBIR

W9drs/wmczcEvgucAVAZn4A7JGZvYDtgT0iYrei21+AbTKzJ/BP4Mz2mE9HMnHixHK

H\n0GaqeW7g/Cpd9PkiRJuudQrhVFFYDnMvPFzPwIGAUcUK/N/sANAJk5HqiJil2L8

7lFm25AF+Ct\n4vq9mbmo+Gw8sFmbzq|DmjNnTr|DaDPVPDdwfpWu2ucnSZlkqXMo  
V6LoP4B/1TmfXlxUZvNoLQi\nKSImAjOA+zNzcgP3OAoY3WoRS5IkSZlkVblyJYqa+q  
q1+m/YSYDMXFhsPdsM+FJE9FuqU8Rgq4Vc\nnrwAACcxJREFUYH5m/m5IA600L774  
Yr|DaDPVPDdwfpWu2ucnSZlkqXOizKbmbFrxphG7AGdnZv/i\n/ExgUWaeX6fNIUBtZo  
4qzqcCu2fmjHpjnQXMy8wLivMjgaOBPYt6RvXv3f4TlqQqkJn1k/eSJEmS\nnqkzXMt33U  
WDLiOgOvAp8AzikXpvbgBOBUUViaU5mzoilDYAFmTknIIYH9gZ+CqU3qQGnUkooLZ  
Mk\nAv/QkSRJkiRJakxZEkWZuSAiTgTuoVSM+trMnBIRxxSfX5WZoyNi34h4Dngf+Hb  
RfRPghohYhdLW\nnuV9n5pjis0soFbi+NyIAHsrM49tvZplksZlkSZWrLFvPJEmSJEmS1  
PGUq5h1m4ul6yJiRkQ8Wefaln8liYEhFPRMSflmLdcfa4MhqZ3znF3CZGxJil+GQ5Y1  
wZDc2vzmc/ilhFEbF+OWJrDY18f2dHxPSI\nneLw4+pczxpZq7LuLiJOK//6eiojzG+vf0TX  
y3Y2q871Ni4jHyxnjymhkf0i4pFifhMiYudyxihJ\nkiSp7VRtogi4Hqj/h/ZfgG0ysyfwT+DM  
do+q9TQ0v2GZ2bN4l9ytwE/aP6xW09D8KJJfewMvtXtE\nrauh+SVwUWb2Lo67yxBXa  
1hmbhGxB7A/sH1mbgtcUI7AWsky88vMby7+3oBbiqNSNfi7BTirmN+P\nni3NJkiRJVahq  
E0WZ+Tdgr1r92bmouJ0PLBZuwfWShqZ37t1TtcC3mzXoFpRQ/MrXASc1s7htLrl\nzK  
/ii603MrfjgKGZ+VHRZma7B9ZKlvPdEaXiaF8Hft+uQbWiRub3GrB4BWYN8Eq7BiVJki

Sp3VRt\noqgJgJGlzul1hYRQyLiZeAl4Lxyx9OaluAYHpmTip3LG3opGL74LURUVPuY  
FrRlsCXluLhiKiN\niJ3KHVAb+SlwlzOfL3cgrewM4MLid8twKns1piRJkqTl6JSJoogYDM  
zPzN+VO5bWlpmDM/P/ASOB\nX5Q5nFYTEWsAg1h6O13Fr76p5wpgc6AXpRUcF5Y  
3nFbVFVgvM3cBTgVuLnM8beUQoOp+rwdxAgOL\n3y2nANeVOR5JkiRJbaTTJYoi4k  
hgX+B/yhxKW/sdUE0FZz8NdAeeilhpILYNPhYRG5U1qlaUmW9k\nAfgV0KfcMbWi6cc  
fADJzArAolj5e3pBaV0R0BQ4Cbjp3LG2gT2b+ufj5j1TXv01JkiRJdXSqRFHx\nFqITgQM  
y84Nyx9PalmLLOqcHABX75qX6MvPJzNw4MzfPzM0pJR52yMw3yh1ba4mlTeqcHgQ  
s88a3\nCnYr8GWAiNgK6JaZs8obUqvbc5iSma+WO5A28FxE7F78/GVKLwOQJEmS  
VIW6ljuAthIRvwd2Bza\niH9R2rJ0JtANuLdUc5aHMvP48kXZco3Mb9+I+CywEHieUgH  
hilRnfh8v5vfjzLy+TpMsT2Sto5Hv\nnr19E9Kl0t2nAMWUMscUa+u4obVW6rnjl+nzg8DK  
GuFKW82/zG1RwEevFGvi3+WPgu8BIebEqMK84\nlyRJkISForTLRZIkSZIkSZ1dp9p6  
JkmSJEmSpMaZKJIkSZIkSRJgokiSJEmSJEkFE0WSJEmSJEkC\nTBRJkiRJkiSpYKJI  
kiRJkiRJgIkisZIkSZIkFUwUSZIkCYCu5Q5AUscXEzsArzSxeWZml7aM\nR5IkSZL  
UNkwUSWqKfYEumZnIDkSSJEmS1HbceiZpuSjiDeBDk0SSJEmSVP1MFEmdXESsu  
olmBwC3\nNnGs1VY+IkmSJEISuZgoUkWLlUR8XhETIqIP0XEWi0cZ92IOK4F/QZGx

OSI+HVL7ItvrPeKOI5f\n2bGacc/9gLVX0GztzHyvTp8eEfFIRPw6ljYsrW0iKeB/42lvdo  
wZEmSJEISGzJRpEo3NzN7Z+b2\ nwDvAMS0cZz2gJQma44C9MvOwFt63rgRqijHbXF  
Ggep3MfHM5bfYB7q57LTMnA3cCYzJz5uLLwNcy\n81KgR0Ss3kZhS5IkSZLakIkiVZO  
HgU8DRMT3I+LJ4vhe3UaNfHYe8OliddL59QduqE9EXAlsAdwd\nESfXaz+07sqgiDg7I  
n6wotgaiiMi/hwRj0bEUxFxdJ0xz4qlqRHxt4j43eLxi8++FRHji3GujliG\n/lv/NvDnOn12j4g  
f1WvTPTNfbqDvdOCTdc63KRJIUEoiHdJAH0mSJEISB+dbz1QVIqlLsDcwJiJ2\nBI4E+  
IBKho6PiLGZObGxz4DTKSU7ej cwdkN9ajPz2GLFTb/MfKtet5uAEcDIxfnXgP9czlhPFO  
3O\nALatF8dRmTm7WKXzSETcQikh9IVge6Ab8A/g0SLerYGvA1/IzIURcTnwP0D97X  
EbZea8OudPAUMi\n4rzMXBARPYGJyz5toJQo6IPcb09gzOIPMvP5iDixkX6SJEmSpA  
7MFUWqdKtHxOPAa8BmwFXAbsC\nMnNeZr4P/An4YtF+eZ81pqE+X1peh8ycCGwU  
EZsUCZfZmfIKS8YCvhcRE4GHijluCfQFbs3M+UX9\noNuBKNrvCewIPFo8my8Dmzcw  
7IKFpzNzFnAbcFBxadffMHN9ITNOBTxYJuo0y8/V6n5uEliRJKqQK\n5B9zqnTzMrN3sdr  
mHmB/SvVyok6bKK6xgs8a05I+AH8ADgY+AYxqyVgR0Y9S4meXzPwgIu6nIOBp\nnaJy  
6bsjMQSuI72MNLseGBkRfwNeWU7f6ZSSVgdQSi7Vt8YK7i1JkiRJ6oBcUaSqUGyh  
GggMAf4G\nHBgRq0fEmsCBxTWW89I7NP72r+WNtzw3UarVczClpFFTxnq3XhzrUFq

N9EFEfA7YhVKSaBzwXxGx\navGmtwH8O+E0Bj4zhvJ1o+l/9dAfAvrXyiKU78Pfl9Sra

EGZebbwPrAomJlVH2LGusrSZIkSeq4\lnXFGkSrdkNU5Rg+g54LPASOCR4qNrFtcAys

zHI6LBzyJiXEQ8CYzOzNPrjNtoH5azGigzJxdJnOmZ\lnOaMpY2XmW3XjAM4Cjo2IycA

zILafkZmPRsRtwCRgBvAk8Hbx2ZSiKPVfiiLWH1F6o1v9otRzGwn9\lnV8DnMnNFyZ5x

NLCaKCKCU sJLkiRJkiRhIrMpO2gkdTQRsWZmvh8RawBjgaOL2khN7f9D4NrMnN3K\

ncfWkIGi6qTXHISRJkiS1PbeeSZXr6qJY9WPAH5uTJCpcQ+ltbK1tT/691U6SJE mSVE

FcUSR1YhHx\lnReClzKy/La2I420DdK2znU6SJE mSVEFMFEmSJE mSJAlw65kkSZIkS

ZIKJookSZIkSZE mCiSJE mS\lnJEISwUSRJE mSJE mSABNFkiRJkiRKpgokiRJkiRJE m

CiSJIksZIkSQUTRZIkSZIkSQJMFE mSJE mS\lnJKnw/wFjTd0LoYWDMAAAAABJRU5E

rkJggg==\n",

"text/plain": [

    "<matplotlib.figure.Figure at 0xa801da0>"

]

},

```
    "metadata": {},  
  
    "output_type": "display_data"  
  
}  
  
],  
  
"source": [  
  
    "plt.plot(xdata, ydata, 'kx')\n",  
  
    "#I have plotted the x and y data oints and have used blue cross as markers\n",  
  
    "\n",  
  
    "plt.xlabel('Root of voltage $(\\sqrt{V})$')\n",  
  
    "plt.ylabel('Radius $(m)$')\n",  
  
    "plt.title('Electron beam path radius against root of voltage')\n",  
  
    "plt.savefig('Weighted plot.pdf')\n",  
  
    "#Here I have labelled the axis and title\n",
```

```
"\n",

"wslope = (np.sum(w)*np.sum(w*xdata*ydata)-
np.sum(w*xdata)*np.sum(w*ydata))/(np.sum(w)*np.sum(w*xdata**2)-
np.sum(w*xdata)**2)\n",

"wslope_error = np.sqrt((np.sum(w))/(np.sum(w)*np.sum(w*xdata**2)-
np.sum(w*xdata)**2))\n",

"wintercept = (np.sum(w*xdata**2)*np.sum(w*ydata)-
np.sum(w*xdata)*np.sum(w*xdata*ydata))/(np.sum(w)*np.sum(w*xdata**2)-
np.sum(w*xdata)**2)\n",

"wintercept_error = np.sqrt((np.sum(w*xdata**2))/(np.sum(w)*np.sum(w*xdata**2)-
np.sum(w*xdata)**2))\n",

"#These are my calculations using the above equations\n",

"\n",

"plt.line, = plt.plot([12, 18], [wslope*12 + wintercept, wslope*18 + wintercept], 'b-')\n",
```

```
"#I have plotted a least-squares fit line by using an array for two points calculated  
from the values above\n",  
  
"\n",  
  
"plt.text(24, 0.046, \"$Gradient \", = \", {0} \", \\\pm \",  
{1}$\".format(wslope,wslope_error), size=18)\n",  
  
"plt.text(24, 0.042, \"$Intercept \", = \", {0} \", \\\pm \",  
{1}$\".format(wintercept,wintercept_error), size=18)\n",  
  
"plt.text(14, 0.034, \"$y \", = \", {0:0.4f} x \", + \", {1:0.4f}$\".format(wslope,wintercept),  
size=18)\n",  
  
"#I have added an equation for the line in the form y=gx+c into the graph\n",  
  
"#I have also added the unrounded values for the gradient and intercept\n",  
  
"\n",  
  
"plt.grid()\n",
```

```
"##I have added a grid so that it is easier to see where each point lies"
```

```
]
```

```
}
```

```
{
```

```
"cell_type": "markdown",
```

```
"metadata": {},
```

```
"source": [
```

```
#####Weighted slope and intercept values"
```

```
]
```

```
,
```

```
{
```

```
"cell_type": "code",
```

```
"execution_count": 7,
```

```
"metadata": {  
  
    "collapsed": false  
  
},  
  
"outputs": [  
  
    {  
  
        "name": "stdout",  
  
        "output_type": "stream",  
  
        "text": [  
  
            "Gradient = 0.00241449374517\\n",  
  
            "Gradient Uncertainty = 0.000458942980418\\n",  
  
            "Intercept = 0.00340560882875\\n",  
  
            "Intercept Uncertainty = 0.00688746634326\\n"  
  
        ]  
    }]
```

```
    }

    ],
  "source": [
    "print \"Gradient =\"", wslope"\n",
    "print \"Gradient Uncertainty =\"", wslope_error"\n",
    "print \"Intercept =\"", wintercept"\n",
    "print \"Intercept Uncertainty =\"", wintercept_error"\n",
    "#These are the precise printed values for the above"
  ]
}, {
  "cell_type": "markdown",
  "metadata": {}
```

```
"source": [  
  
    "The rounded values for the above are as follows:\n",  
  
    "\n",  
  
    "$$ g_{2} = (0.0024 \pm 0.0005) \frac{m}{\sqrt{V}} $$\n",  
  
    "\n",  
  
    "$$ c_{2} = (0.0034 \pm 0.007)m $$"  
  
,  
  
{  
  
    "cell_type": "markdown",  
  
    "metadata": {},  
  
    "source": [  
  
        "####Combined graph"
```

```
]

},

{

"cell_type": "code",

"execution_count": 8,

"metadata": {

"collapsed": false

},

"outputs": [

{

"data": {

"image/png":


"iVBORw0KGgoAAAANSUhEUgAABGsAAAEiCAYAAABORI+eAAAABHNCVQICAgI

```

fAhkiAAAAAIwSFIz\nAAALEgAACxIB0t1+/AAAIABJREFUeJzs3XeYFFXWx/HvAVQE1

NE1ICZQzFI2URddxhwwYM7KGvAF\ns5jWcVd0HRUwgCKurtlVUVdIVYyrjAGzoq4BF

WEMqBhgDBgQOe8f9/bQ0/TMdM9MR36f5+mnu6tu\nVd1bVY3WmXvPNXdHRERER

ERERESKQ7tCV0BEREREREREROZTsEZEREREREREplgoWCMililili\nnUkQUrBE

RERERERERKS1K1oiilililiFBEFa0REREREREREioiCNTlgZgPM7JIC1yNbZlZrZtsV\nn

uh65lu92mtlNZvb3+HlrM5ucr2O3lpkdYmaPFroe+WZmg8xshpI9Z2ZLt+F+a8zsqLban4

iilili\nlCcFa1ooPvD/aGbfJ72uaMP9dzezeWaWz2vk8VU2kgMISfLdzvrjufsz7r5OHo/dK

u5+m7vv1Nr9\nxHt59baoUwbHatVvx8wWAS4FtnP3Jd19VhtWr/5eKNWgroiiii5F6HQI

eghDmwm7s/mePjWKMr\nzNq7+285Pr4kacU5b/Q6LkQyPgtdG+39Jx3BToC77by+CI

iilili2injV5YGbrmNnjZvaNmU02\ns/2S1i1uZpfGnjp1Zva0mXUEno5F6uJQjC3iX+\lnmtll

ZvY1cK6ZLWImt5jZl3EfVWZmcd8DzOxZ\nnMxthZjPNbKqZ7dxMdXub2dux/A1mtlhSXX

czs9fNbFasx4ZJ684ysymxrm+bWf+kdcn1nhXL/dHM\n/mxmH8fhJoc3cf5qzOwiM3vRz

L41s3HJQ1PM7G4z+zyev6fMbL24fCBwMHBG7Pn0n6Tdbmpmb8Rt\nxia3M+XY6c75

6mb2pJl9bWZfmdm/zGypG02NbPX4rkYS3jwT6yrNLNPkr436HGSMmRqWTN7MJ6z

\nb+K9kTYAYWaj4rn81sxeMbOtktYtbmY3x2v6jpmdkVKH5q7dM0nf55nZsWb2fqzX6K

R1PeP5r4vn\n5Y64PHEvvxGvQ/3938x5bureNjM7Jy6fEdu3ZNxd8m/nezPbPM3xFjOz

kWY2Pb4uN7NFzWwt5gdp\n6szsv2m2fdjMjktZ9kbivMV7++V4HI4ysy3T7GMd4B/AlrG

OM+PyfmY2KV7Hj83s3JTtDjezj+K9\nl2j/dknnJHEtvzazO60Nh3CJililiEj+KFjTOs3+5d7

MOgOPA/8ClgMOBMaY2bqxyCXApSCWwDLA\nGcA8YOu4fqk4FOOF+L038CGwPH

AhMBpYAugB9AUOB/6cVIxewGTgd8Bw4Ppm2nMwsCOwBrAWcE5s\nx6Zx22NiPa8

B7rcwZARgCrCVuy8JnAf8y8xWSKnHG3HbO4C7gM3icQ4FRptZpybqdlhs14rAXCB5\

nyNI4oCfh/L4G3Abg7tfGz8PcfQI33zOpnfsBOxHO20bAgCaOnXrODaiOdVkXWAUYG

s/TosA44GZg\naeBuYB8yH3aVPERrCPAJsGw89l/cvbH9vARsHI95O3B3rAvAucCqsa

07EM538n6au3ap+gG/J5y3\n/c1sx7j878Aj7I4BrARcCeDuf4rrN4rX4e5G9pvNvf1n4Aig

Elgd6BLLQ8PfzhLu/mKaY1XF420c\nX72Bc9z9fWD9pO23T7Pt7cBBiS8WgoOrAuPNb

BnC/TiScK9fFpc3CJq4+2TgWOD5WMdI4qofgEPd\nfSnCeR5kZnsmHeeqeOwVgaWA

bsy/licCewB/iutnxflilillJiFKxpOQPGxd4FiVe6xKG7AdPc\nWZ3n+furwP3AvtZyKnxZ+

Akd/88rn/B3efQeCDoM3e/yt3nAb8CBxAe4me7+0eEXBuHJZX/yN2v\nnjw/5twArmtnyje

zbgdHuPj3m6ahm/kPpQOAad3/Zg1uAXwhBJtz93+7+Rfx8F/ABkNyjXEOOnBCo\n6Qac

7+6/uvvjwBxCwKWxet3i7u+4+4/AXwlBAovHuym2/1dCsGFjM1siafvUc+nAFe7+RWzn

A8Am\njRwbks65u//s7h+6+xOx7I8DIxOCCQBbAB3cfZS7/+bu9wAvN7HvpswhPHR3j/  
ua2FjBmFtmVqzj\nZcBiwNpx9X7Ahe7+rbtPB0aRdE4yuHapLnB379z9E2AC88/dHKC7  
ma3k7nPc/bks25vNvX0lcKm7\n17r7bOAwwIHxN5XJ8KeDCfff1/Eanpe07+a2HwdsYm  
arJNXInnj/9QPei9djnuPJQRL90iznwWO\n4+5Pufvb8fP/gLHMv7f2Be539+fsf5Gw6Db  
sYSA02dJv4V9Lb95r0REREREpA3of+JbzoE93X3p\npFe6XiurAZsnB3UID4orEHq7d  
CT0JsjUJ0mflwUWAT5KWvYxoVdDwhf1FQ6BDgi9EDLZ/8eEoEqi\nHUNS2rEyZiQG  
J4xKWndBoT2JcxI+vxTrM9XKcuyqdciwLJm1t7MLo5DP74FpsUyyzaxL0g6L1ke\nGzN  
bwCLQqU/jMW9lflu7AdNTtv+i7CQe4kcQer08ZmYfmtmZjW5gdpqFIU518fwvxfxz0C2ID  
Z+m\nnbNvctUuVfO5+JPR+gdArzICXzOwtM/vzAls2LZt7e8U06zoQfleZ6JZm+26NIG3A  
3b8n9J5JBDIP\nJPbmivv4OGWTjzLdt5ltbmYT4tCvOkIAJvneqr927v4T8E3S5t2B+5Ku  
4zuEXmiZnhMRERERESkS\nCtbk3sfAUylBnSXc/TjCg9bPpO9R0thwl+TIXxN6IHRPW  
rYqKQ/jWVo15XMi8PAxUJ3Sji7ufqeZ\nnrQZcCxwHLOPuSwNv0bZJdVPr9Suh/QcTei1  
sF4eO9lhIEsfOZPhRc2VS118I/AZsEI95GPN/S5/T\nMFgGldDVmB+B5OFfKyaO5+4/u  
Ptp7r4GoY2nmtm2qTsws62B04H93L0inv9vmX8OPicM1UpYJWnb\nNrt27j7D3Qe6+0  
qEIMMYy24GqGzu7c/SrJtLCApmc3Tbf9ZFnW9Azgo5qPp6O4T4vLpLHi9V2PB\nAB

6N1PN2Qs+dleNwsn8w/1p8RgiQAiEXEQ2Dah8DO6f8Rju5++dZtEtERERERIqAgjWtk  
8kD7Xhg\nLTM71MwWia8/mNk6cbjHDcBlZrZi7CWyZcw18hUhd80aje3Yw2w5dwHVZ  
tYIPnifQsiP09L2HGdm\nK8XcG1XAnXHdP4H/M7PeMZFP55gMtQvQmfDg+TXQLvao  
2KCFdWisXoea2boxr835wN1xSFUXwnCs\nnmTE/0IUp284g5DRpbv/Z6ALMBR4zs5Ulg  
ZKE54G5ZhZivNZ7A39oYI+vA4fEa78zld9lqFRI6Nwz\nDvf6jhAgSjdD0hKEQMXXFpLk  
/g1YMmn9XcBfzKwi1vd45gcKWnvt6s+dme1nZolgQI3c77z4fQZN\n3MupMri37wBOsT  
BNdxfCdR8bf1PN/nbi9udYSOK8LGFI0a2Z1g94iBCEOY8wVCI5+Vpm dpCZdTCz\nA4  
B1gAfT7GMGsHJS3icI99Ysd59jZr0JwciEe4Ddk/6NGErDe/cfwIVmtiqAmS1nZumGX4  
mlili\nSJFTsKZ1HrAwk0vidU9cXp8kNg6Z2JEwVGI6oZfDRUAi+etpwP8leU2+iessDlm  
qBiZamMVn8+T9\nJjmBEDiYCjxDGI5xY2o9kjTV68Dj9o8RhmZ9AFwQ2/EqlbnwaGB  
mXHd4XPcOIZ/I84QhMhsAz6bs\nN5t6pKvXrcBNhPO3KCGZKoQ8PB8Rzu1bsQ7J+7  
4eWC8ODbm3if031ZMpdd15hOTI3xLy3dzD/Os9\nB9ibkLD4G2D/uD51nwknAbsTksE  
eDNYXtK4nITn198BzwFXu/ISaOj4SX+8DtYRhXclDcc4n9EiZ\nRri2dxPyy7Tk2qW7jolv  
wdeMLPvgf8AJ7p7bVw3FLg5Xod907Qh23v7BsI98XRc/2MsT8pvZ1YM\nneqS6AHgFe  
DO+XonLGmtnw8qG63wvsB2hN0xi+UxCnqohhADYacBucXmqJ4C3gS/M7Mu4bDBw

vpl9\nR8jNIAiWEnPZnEAIDn1GuC++JAQrlEQiup8wbO47wjVN13YRERERESly5o1OL  
pPDg4YeBCOB9sB1\n7j4sTZkrgF0ID2ED3H1SXF7L/F4Gv7p777h8GcKDzWqEB9b9  
3b0u542RnDOzCcCt7n5DoetSDsxs\nEOH3sU2h6yItF3sUzQJ6xgTMIililiJSJvLes8bM  
2hN6Z+wMrEfl+7BuSpldCQ8gaxJmlbo6abUD\nle6+aSJQE50FPO7uaxH+Yn1WDpsh  
+deW+W8WKmbW1cz6mFk7M1sbOJWGPXiKRJjZ7mbWKQ75uwR4\nU4EaEREREZ  
HyU4hhUL2BKXHK3V8JXfr3TCmzb3AzgLu/CFSYWfKMJuke3Ou3ie/927TWUmj57wJ  
W\nPhYI5DP5jhDIHAeMKWiNpKX2IAz5m07lyXNgYasjlililiK50KEAx1yJBacR3jyDMisx  
f6aX/5rZ\nb8A17v7PWGYFd09MDz0DTVdbNjRcp3Xc/WNgw0LXQ1rP3Y8h5I4SERE  
REZEyVohgTaY9JBob9rKV\nnu39mZssBj5vZZHd/psEB3N3M1BNDREREREREREpOI  
YI104FVkr6vQu501SZleMy3P2z+P6Vmd1H\nnmBb5GWCGrXV19y/MbEXCLCkLUB  
BHRCR77q68USlililieVKInDWvAGuaWXczWxQ4gDDdbLL7idNC\nnm9kWQJ27z4iJNZ  
elyzsTpsR+K2mbI+LnIwh5OdJy97J8nXvuuQWvg9qn9ql95fcSEREREZH8ynvP\nGnef  
a2bHA48Spu6+3t3fNbNj4/pr3P0hM9vVzKYAs4E/x827AveaWaLut7n7Y3HdxcBdZnYU  
ceru\nvDWqSNTW1ha6Cjml9pU2tU9ERERERCQzhRgGhbs/DDycsuyaIO/Hp9luKrBJI/  
ucCWzfhtUUERER\nERERECm7QgyDkhwZMGBAoauQU2pfaVP7REREREREMmML

Wz4CM/OFrc0ilq1hZrgSDIulilil5l16\n1pSRmpqaQlchp9S+0qb2iYililZEbBGhERERE  
RERGRlqJhUCl0iQNgxIRERERyS/1rBERERER\nnERERKS1K1pSRcs+ZofaVNrVPRE  
REREQkMwrWililililgUEeWsERGRJilnjYililhfnUodAVE\nylVNTU390JiamhoqKysBqK  
ysrP8slilililkko9a8plckCgHJVy+2LPhCbLIHL7MqH2IS71rBER\nnERERyS/irBERERER  
ERERKS1qWSOSB5n0rBEpVupZlyliliKSX+pZlyliliJSRBSsKSOJZLb\nnSu0rbWqfilili  
lhZhSsEREREREREREplspZl5IHylkjUw5a0RERERE8ks9a0REREREREREioiC\nn  
WWk3HNmqH2ITe0TERERERHJll1lililijFRDlrRPJAOWuklCInjYililhlfqlnjYililil\nnilh  
EVGwpoyUe84Mta+0qX0ilililiKZUbBGRERERERKS1KGeNSB4oZ42UMuWsERER  
ERHJL/Ws\nnEREREREREREplgrWIJFyz5mh9pU2tU9ERERERCQzHQpdARGRhVIN  
TU19oKempobKykoAKisr6z+L\nililiMjCRTlrRPJAOWskE8V6nyhnjYililhlfqlnjYilpOcOjz  
1W6FqlililiCx0lOmjJR7zgy1\nnr7SpfSVk7ly4/XbYdFPeOu7qQtdGRERERGSho2CNilg  
Es2fDFVdAz568culT7NXpEbb/4b5C10pE\nnREREZKGjnDUieVCsuUiкуBTsPvnqKxg9  
Gq6+mmfXPYbqOafz1qcVnH46HH00dO6snDUililvmk\nnnjUilgurqVPh+OPxtdbmv69U  
UNmjlsM/qWbvlyuYMgVOPBE6dSp0JUVEyo+ZrWZmdxW6HII4ZnaC\nnmR1W6HqISP  
FSsKaMIFXOjDTUvtKm9hWR116Dgw7C/9CbB2b0ZoseX3DC1FM4+oROvP8+HHMM

LLZY\noSspIIKezGw54E7gIELXRQpqNHCgmR1Q6IqISHFSsEZEZGHgDo8/DjvswG+

79+euDgezSbcZ/G3K\n4Zx+9qK8/TYceih00ByBliK5djtwsbtPTywws/Zm9oiZvWpmv5n

ZPDP70cxei8stqexeZvZuLJMo\n94qZbVyQ1rSCmXUzs/fMbFwb7GuMmU2N5+Sjtqh

WzCz7czsRTObE+vWHyDmZTgcGGpm3QtZx2J\nZjub2UQze87MnjWzcWa2fq7304L

y25vZeDN7yswmm9ndZrZIE+V3MLNHzezpeG+MNbPNsm1XuSiF\n6xz/fbnVzCrNbA

Uz62JmG5vZX81sYob1+6OZvZNVmxa2PBrKWVNeampq6ns01NTUUFI

ZCUBIZWX9\nn52KgnDWSiZzcJ3Pnwr//DcOH8+vPv3F7n6u46Ok+LL2Mcc45sOuuYM1ko4n1Us4aE

ZFWMrPDgSPc\nfbsmynwKrAjs7e7/aaLcKGBzYGd3r2vzyuaBme0MPARc4+6D2mB/q

wHTgNvd/dAMt9kR+Bewmbt\n2to6NHGc+4FdgeXdfWbS8hOBPdx9+1wdxSZ2R7Av

cDB7n5XXFYFnAFs4+6v5WI/LSh/KLAcli7\nzzazJYAbgL2AU9z9ypTyA4CBwH7uPt3

M2gN3A3sAf3b3WzM6QWWihK7zTYTgaqqvgV3c/dVm6tcB\nneBVYwt1Xz6RNoGCNIJ

FiDogUc92keLTpffLjj3DjjXDppfzSrQc3bnw5wx7akB49QpBmm22aD9Kk\n1EvBGhGR

Voj/sz4FOMrdn2ikzCrAR8BcYGI3n93E/i4DnnH3kp62z8y6uvsXbbSv/YGxwCB3vybD\n

bcYSHraXzWXQy8w+B75y941SInGPgb6u/szuTp+KYkBj3eBD9x9m6TI7Qi/j6+AXs09

1GW7nxaU\n7wpMAH6f/Fs1s8WBqcBywBbu/krS/t8mBAa/Tiq/MTAJ+B7o1tTvypyUyn

WO624Cdgcq4qKZhOGs\n57n7Vxm09VTgEqA2m2CNhkGVkZLKmdECaI9pU/vy5Ouv  
4bzzoHt3Zj/yDCP3ell1ap/ggdqNuO02\n48knYdttMw/UilhIm9mP8IfStlGaaOv4/mYGD2  
x9gKfapGYF1FaBmqhvfH86i236AO/kOFDTE1iB\nnNNcrXucbgDNzdfwStC/QDbgjeaG7  
zwPuAjZh/m+ILfeTbfkBwNjU36q7/xTLtwoOT1rVB1iZ0JMr\nn2XvxvQuwXgbtyqs47OeF  
HOy6VK4zgBN6Sy0J/M7dl3P34zMm1HQDtEEgrKiYI2ISDmorQ3TN621\nnFt9N/ZqLD  
n2L1V8ay7Of9uD++2H8ePjjHwtdSRGRhdrBwPhmyiQeEJrsYWFMXYDFkofTCBCCN  
V+7\n+7uZFI7DplaimfPdBraK740F154EdjSzpXJcj1KxR3x/Jc26SfF9txzsJ9vymwNnm9  
k5acpPju8b\nJi1LzLG5g5ktk7S8Y9Ln9Psq9AWJwQb21qpXOcEc/fZLQjsDiMEY7P+  
U6mCNWWkmHK05ILaV9rU\nvhx5/XU4+GDo1YtvbFn+dsRHrD7+St75ankmTAjpajZb  
aFPWiYgUBzNbDNie5nt8ZBSsAbYAnm9t\nvcqJmf2O0Cvh2Sw26xPfs9mmJZoL1jxHe  
C7bNcf1KBUbE3oyfJxm3cdJZdp6P9mWbw8sAuyfpnyH\nnpDIJDwMPAlekBFoTAZ1ad  
38/zb7KValc54SscxWY2Q7Ap+6eVWLhBM37ISILtVJJUt2AOzz5JAw\nnDm+9xRdHVX  
HZcjdy/b8WY++94YUXoGfPQIdSRESSbAYsBrzZWIH4l/b1CA8EzQUPtilp8GNmywK3  
\nAI2BCe5+qpktCQwlPAguC8wCjnH3D9Mc+2+EfAyLEHLqvJq0bgXgZWCIu98dlw0A  
RgIHuPujKfva\nkjAt+fKEAMQvwlnJvV3M7CJC8GoRYKC7v9TIOTHgGOBI4FfgO+Ao

wjCFN9z986Tif4rvz8akr38G\nFo1tv9jdb4773AE4O5ZNPQPNLOBwOfufnCaejTbpqS  
y+wMnEf6K/itwAiEl925jQybc/ds4S8wW\npAzNaE5z59LMHiY8LB6TzX4LJeZ2WjV+Td  
dzLLGsa1vup4XHHUbIS3NFmvKbxvf63htxeNQeacom\npm8/K826RGLyAYQeLI8CR8  
fPV8X3b4ET3P2zdNsXoxK7zgntzex4wnCoRYBa4EJ3n5ymbCJIfwbp\nr3lm3H2heoU  
ml6cJEyYUugo51Vz7ivnaZIK3hf36FYPW3ENt0b5mj//rr+533uneq5f7Ouv4RyPu\n9OM  
HzfWII3Y/4QT3jz9udRWaqIfB//3WSy+99CrVF2H2l3IApybK7BHLvJfB/h4DVkr6fi0h8LB  
B\b3McJwH3AxnG9Ebr3P5NmX/sD58bPd6eWSar7bknL/hmXXZW0zICLgC+AHZKWb  
wU8hfT9aOAvScd7\ntpE2LgKMIyRq7RmXbUgIHM0jBI+Sy4+Myx8IDDIoH5efQEjYvFa  
aY3xACKI0dp4zaIPs8ksISWJ7\nx+8rAi/Geo1p5po+CDyZ5X3V5LkE1ojHvrbQv4Es2r  
R0rPOcRtavGdd/1Jb7aavjxrlVhMDiXEly\n4abK7gjMJgRb0q0/FTgfaBe/30MYNvdgvL/  
6xPtzZA6vSXdg2sJ8nYGbCLM5/V/Kvy2zge0a2dff\nCDO9Jb7XAIOzOU/qWSMiUux++  
ql+Zie6dmXKMco4+KVtufdC45hj4N13YYVcjCQWEZG2shrwm7v/\n2ESZTPPVtAe6uv  
v0+H0xQuDmf2aWGNZzDiFQ8wWEiLuZvUv4i3CqI5ifn2Et4leU9VsRHI6S63UW\n0A/  
4OWnZ+YS/lm/pDXt3fEHoVZT4q/b+7r5jXLcO6f+6DTAmHqO3u0+J7fifmU0GegGpCU  
8TPWse\ndveRScvfl/SG2QSoH2JiZisSghnXNXL8jNqUtL/TCA/WhyfKuvvnZlYD/IHmk0

HPIgTbMpLhucx0\nWF1TxzkSOKyFm88Djnb3aVls0zm+z21k\W/xvbn8Ptnup62OC3Ai  
IVnwFZ5m6mkzW4SQv2oJwnCb\nkcD1acr1AP7g7gclLX6b8Pv+c7y/ziT07nk9g3oVk1  
K7zj8TetHck1jg7lea2d7A7Wa2prt/l1hn\nZmsAG7j7+c3Uv0kK1pSRoh2y0UbUvtKm9rX  
AN9/AmDEwejRssQVvD72bCx/ZjEer4Ljj4IMP4He\nna/vDiohIm6ug+cShiQfr5oZAbcr8J  
JgQAgFPxs+/j+9n+IKzLHUDvkIeYGabAc/HYM56hJ4rqcIS\nntwLecvf6+rv7N2Z2B2H6  
W8xsE8LQovsSgQozWw7YjhDY+Uvc9E/AA3H9hsD6wGmpDTSzvoThTne7\n+6SU1c  
sAPwEvJZVfivDQ+0JKoAZCAmFYMJRCO6kzSOURZsws+6EwM4kd0+d6We5+J5J  
sCabBMPJ\n53ITwrkckqYMZDc7VgPufgNhtqp8mdfM+kSS3ubKZbufNjlu/B2dDdxPCN  
4twN1/JfSoSUwjfTMw\nzcyOcPdHkooeRujZIWx9QkDhvij9LOB6d/9fM/UvNiV1nd39/x  
op/wghsflRwOVJyy9mwd9j1hSs\nEREpNh99BJdfDrfcAv378+pVL1B9ew+eOx1OPhm  
uvhqWXLLQIRQRkSx0JHSXT8vMOhHy2jjN94LY\nniqQHf3d/lvkBnkpCnpS7U/bfkRDUE  
ThIX5OY/xf5I+Lxb03arhthCM ToNPVYJKmuxxOGDK1IZs8S\nHnRmEhLn7ujuX8a6Ps  
n8wNJRsa63sqDENNYNAh+xV9FWhKDMr0mrto7Hv4cFbUV4uH05ZXkikNHY\n+c6o  
TdEJhGucGqiBcE3eTxM8S/UtoTdGRILO5TGkP5dbE/LVZD1lcAF938z6xMN0ag+w1u  
6n1ceN\nns7SNJQTRDvlwFXST3P37RL4k4D9m1tfdE73G/u5x/EzcvxGu6aRELw53/xlo

daDGzI4g5MVJpyPQ\n1cwmNNYMwjCut7M4ZMle5xSJfd2lgZrzGwf4FV3T5fAOCu  
DaqMJJKkliu1r7Spfc3bEOCww8L0\nTYsuysQb3mPXL25gz5N70LcvTJ0KZ52IQI2ISA  
n6mZDsjEbjE/6l+pWnSQCcYhtggYem+CD3J8JD\nQupwqx0liUgbTB3uQeKB8iDgZXf/  
JKIIordPup4Zq7j7e/FzJeGBbSd338rd/+Tu/d19eEpQI1HX\nRYFDgYc8JelufODdnhB8e  
CJI080IQ0dSe6kkAi81KftKzLD0XHLPoKRtPmkikJFNm/aPZRsEw8xs\nVUKwq7leNRD  
uj5+bLZUiMRwKeNzdv05a3pUwzCvX05K3KXf/npDvZZFGiiSGsTQZ/Mp2P609bgwk\n  
3kIIKLy/uzc2zCZdXb8m5DZaBLggaXnq7EMbERJmNxY0aTF3v9ndt0n3Ag4Evmhsvbt  
vm2WgpqSu\ns5n1M7OXzGyndFWI76vEsp0Jeb4ubaremSpIsMbMdjazyWb2QRxnI67  
MFХH9G2a2acq69mY2ycwe\nSFo21Mw+jcsnmdnOuW6HiEiruUNNDeyyC48Avv4GP  
HHDR2zz8nAOO3U5+veHDz+Ek06CTp2a25ml\niBSpOuY/BKSTmJ2kybwTZrY88LtG  
coBsTEieWZNm3d7AHOYPnUjd7/rAyqQEc4De8f25IPlrM/8v\nnysRt67zh7ExN6U8Yzp  
RueM1ahMDVW2mCTpXxPTX40ZfwAJaaH2RrYAXCQ3Ry/ZchDCd5JmX5cklf\nM2pT  
HMayEvCtlzgrzDaN1DedzoShUNnaCvgdleFsslbnqymgd4B2ZlaRZl0iS98HOdhPa447  
Cpj\n7kem9lbZMOnzyWY20cy2SrP9p/G9d5p1CdvF9zYP1jTDcrTfUrnOxxOGmB6fpn  
xiH4lg8JaEWeMe\nM7MJyS/CvxMrJi1rNkdV3odBxajaELEfDrwspnd7w2n89u\nvkPV9T

TPbHLiaMJVdwkmEk7xE0jIH\nLnP3y3LdhmKlnCCITe0rbVm377ff4L77wvTb332Hn3Y  
6qz3Snl7jzuTbm+Hss+Ggg6CDBquKiJSD\nj4AuZtZil4/WAAAgAEIEQVSpkSTDif/RTz  
u1c5LzgRGNrKuM7zXJC81scUKwZry718UhUTemJC1d\nN76nBht6Aj/6glMCHwbcnv  
R9JiEYIJaZ9QS+dve6uOgowl+ux8f1dwIHxofc9rHM+wvsKLTxF5KS\nC8eeOJsBj6bpi  
XBYrNfYWHYM8FfCDDrQcPrzXWN7E9MwZ9Qm5j/INIZfiMEA7vL3fdvZJfdCLPF\nZ  
Gu9+J7tMK+MmNIRhF5QLTGPMF381Cy3e4bw7LcBC+ZwSjzgZpKHJ9v9tOi4ZnYS0  
MXdB6QsN0JP\nmT3jompCD7dT0+w/8Se5xG8k0Ttq0aThNNsRhvQ12NbM7nX3vVP  
rVQJK5Tp/BfxlyvDSaMX4/hqA\nu/+X+dO2N2Bm8wi9+bZJtz6dQvSs6Q1McffaONZ0L  
PNv4IQ9ClmWcPcXgQozWwHql/m7EjK3p0b5\nchX1ExFpGz/9BNdcA+usA5deyovb7  
8RNZ77MpqOPYi4XMGQIPPtsHcssM16BGhGR8pHIKdGjkfUv\nElbArNzYDmlehC7u/  
p9GimxDGDqU+vCxNeEPnLfF7/uzYO6aRB6H1DwNPVOXxW7+m7t7cm+RRwg5\nL  
RZPU+/uhKnF28XvnQgPnXe5+7w4483MpEDLO6QZDmRmveJ2L7n7L0mr/kgI8NSkb  
kN4ZnjM3WfG\nJMqv7v4N84NTr8d9dyDM4JPc0yejNm7LEKviHkpZTYmBMk+dvfpsd  
dOU/kyetCy3COJHlJM9F0\nlsyk9U22w1NSufv1TQx/ae61XQsCNTA/99CuadbtRgijjU  
teaGanmNnTZrZu0uJs99OS4+5O6E0x\n0Mw6JL8I92ZyoPNTQu6qdA/968f3RNLoZQi

/hUnx+1KE3/gn7I7/mzSz/Ujp+VZCSuU6PwoMcPdb\n0pRPBNCuTbOu9TxH87E39gL  
2Bf6Z9P1Q4MqUMg8Af0z6/l/iHPWEm3tTQnfHB5LKnEuIRr9BmPqs\nopHje7maMGF  
CoauQU821r5ivbSZ1W9ivXzFozT3UbPtmnS/4AL3FVZw3203n/PkM37zTfN8rbXm\n+n+  
gorTPU77vjeAZ81a5YPHjzYZ82a1eK6tLV4XvL+3wu99NJLr3J5EaZ5/hE4plky1YSHh  
A3TrOtP\neMBYtJFt2xGT36ZZtwMhkLAela/CQ4ClFmS0OP9hqRlg+lxewN6xWUdgGu  
ATVO270HoEVCVss/j\nCUIwV09a3pnQO2YwIU/LOEL+m+T9XUYYZrV0/L4VIZAxDzg  
/zXmbB/w+Tds/BYYR/qB7PbBVXL5n\n3GYDQqDnSmDPVrTpOMIMVSvH75vG55fxw  
Adx2XnANo1cv0UIAapDW3BvbRqv0f8l1fE/sX3jCn3v\nnt+I381/C7GXLJC3bMrbr72nK/x  
DXXd7K/WRcnjAdfOK4jb1OTCo/kDAkr0PKfvrEsh8DK8RImxGm\nl76Y8Pu+Pt6ns4FIY  
5ltCcPf2uX4WnQHpi3E1zkx1Xq3lOWbxvlXZNDONWLZWcnHbO5ViJ41qd0T\nG7NAr  
xkz2w340sMUfqnrryb8o7oJIzt2myT1ERFplU8+gVNPhTXWgA8+4JeHn+Sa3R5g7aO  
24sab\njDFj2vPuu0vzzDMhfVdVVRXV1dVUVKQbRisiqXIQ0+Q/xL+2NiYvxlexh6LuS1  
2NLMjzWwc0AvY\nz90bG5azOCEY9l80x36c8FffO4CbCLO2eEqZ7whTCf/OzB4xs7u  
Bju6+D6HHyVVx2e3AvzxOm0P\nOXT6An3N7EUze5LQe342sIMn9a5w99mEQM1xh  
OEI13rDpMYApxNmNnrGzGqAfYB/x3Xp8r88B7ya\nZvmxhL+UPwdM8DBzFh56J40iz

N70JGH68gY9lrJs01XAcODxWN+BhF41xwCfmdnLwlru3liukS0l\nQaOHGlnfqHgtDge  
Oj7NW3QskkISXYr6ahMMIwwf/a2b7m9kAwh/txxGGA6a6kRCwHJeyPNv9ZFN+\nGO  
G350286ocWuvu1hJ5vT8Xf+E4WZmG6jXCPVrr7jFj2NeBCwqiUGslwvxMIQb//mtkLhK  
TgGc06\nVcSK/jp7GA10HHCbmQ2J/zYPJvybdLa7n9NY48xsFzP7hjBM0gnB1C/NbEb  
MFdYkS/m3OufMbAtg\nqLvvHL//BZjn7sOSyvwDqHH3xPjSyYQxnycSTuxcwhRiSwL3  
uPvhKcfoTuh1syEpzMyPOOllunfv\nDkBFRQWbbLJJfb6Jxlwu+I56382MCRMmFE19kr  
9vs802uHvR1Eff039P3ENtsr+33qJmyBB4/nkq\nBw7kx2NP4YxRH3DnnfCHP1RSVQ  
W//jq/fG1tLT169OCOO+7gwAMPLOj5SHyura0F4Oabb8bdNcxU\nRKQVzOwgYIS7Nz  
rUKZZblRg4Ifyl/REPQ20Wamb2IKGXUIW7/1To+rQIM7uY0KOqXxvtbyxhuNva\n7p5Jg  
taiFHO+bE/oAWWEoNrzud5PWx23if0vEfe/JiHI+ry7pws2FoX4bD3B3Rsbxtna/ZfEdY6  
5\nd3cjJEH/HHjYw7DKnClEsKYD8B5hfNdnwEuEiGBqguHj3X3XGNwZ6e5bpOynL3C  
au+8ev6/oMVu7\nnmZ0C/MHdD05z/NQ/JkiZMDOK9doWc91kvIZfJ3d4+umQNPi11+DE  
E/nukEGMub2CkSOhT5+QOLhX\nnr4ab1dXVUVVVxZgxYxg8eHDR9ayJ50XBGhGRV  
oj/DzwVGOujxS6PsXKzNql9hSleWO+AN50963T\nnb1ma4n3xESEnxuNZbnsUoUfPse  
7+77hsmbi/Z9w9XU4OkazEfEv/cfc/FrouC5u8D4PyMOf88YRE\nPe8Ad7r7u2Z2rJkdG

8s8BEw1symEcbGDG9td0udhZvammb1B6LJ4Ss4aUaSS/ypejtS+0lbW7fvt\nN2rOPx+  
23BKOOQb692fmq9M49+e/sEavCt56C554Au65p/FATXV1NQDV1dVUVVVRV1eX5k  
AiIIKq\n4v8D/w04s9B1KVZmth3wnZmdkbLqWEKS5GvyX6ucOwx4L9tATXQyYRhO8v  
Ti5xNyH53QBnUTwd2/\nUqCmMAoy14i7P0xFnp3vyble7p5zJPXP0XSmNXUoVAiljn  
3889w661wySXQrh1UVzNjiz25bFR7\nrtsQ9toLnn8eevZsfBcTJ05s0JOmoqKC6upqJk  
6cSL9+bdlbWkREioS732Rmh5rZ3u5+b6HrU4T2\nJgQfpiUWmNIhhCSrf3f3fxWqYrkQ  
h8OcCeZVwl1MlyRAAnhiHdJwO7Afs4e4fNr2piBS7vA+DKjQN\nngypfxTzUqJjrJvNlfJ3q6  
uDqq+GKK2CzeDMM/mk+9aMuMT417/gkEPg9NNh1VVzdPw80zAoEZG2\nY2bLEh  
LJ7uXu0wtdn2JiZhsClwizZwFUAB8QUiKU6vTEjTKzmwiJY+9o4fYrE3obdSGcs5eBCx  
Op\nIUSktCIYI2WjWB90objrJvM1e50+/RRGjoQbboDddoPTT+fDTthy8cVw771w1FFh  
4qeuxXN0/AJR\nsEZEpG3FJMKXuPv+ha6LFlaZHUOYZOX6QtdFRIqTgjVlpKampn5  
WI3LUXPuK9UEXMqvbwnb9ampq\n6vPYJK+rrKws2Hlo9Dq9/TaMGAH33w8DBsDJJ/  
POD6ty4YXwyCMweDD06IXDnntW5ub4BaZgjYiI\nnilhfhUkZ42ISHJQxsyKLwGxO0yc  
CMOGwcsvwwknwJQpvFa7DNWnwLPPwsknw1VXwVJLQbFVX0RE\nRERESpd61kj  
ZKNZeCVDcdSsGxXJ+zAz/7bfQg2b4cPjySzjtNDjiCJ6btDjV1fD66yEfzTHHQOfO\nOT

h+EZyHVOpZIyIiliKSX+pZIyIC8MsvHAMw3nqwxBJw5pI4/72Y8HR7LugH06bBWWWeF

3DSLLdbc\ nzkRERERERFquXaErlG2n6laRtDG1r7QVa/sevesufjrvPFh9dfYFuPpqZj36

GEPfWo0/bt2ewYND\nmpr334djj208UFOs7RMRERERkdKjnjuisnCaPh1GjWKH667jl

WWXZZ2xY9n1T3256ePenLb/TFZY\nYTP+9jfYZx9o377QIRURERERkYWJctZl2SjWf

B9Q3HUrBnk9P+++C5dcAvfdB4cfDqecwtedl+LA\nA//DE0/8geWX78Tlkcty4IFdsDxna

SnW+0Q5a0RERERE8kvDoERk4fDcc7DnnIBZCd27wwcf8Muw\nkVz76GpsvnkFP/xw

AHAiL7wABx2U/0CNiiiihlgoI1ZaTcc2aofaWtIO2bNy/M7LTVVnDYYbDz\ nzjBtGj8O+S

tX3PY7evYMHWxGj/6eXr2GAE9wySUjqKury/pQ5X79REREREQkfxSsEZHy88svcOO

N\nsMEGcN55cOKJ8N57fHfIIZd2YnVV4cJE0Kg5o476njwwbOorq4GoLq6mqqqqhYF

bERERERERNqC\nctZl2SjWfB9Q3HUrBm12fr77Dq65BkaODIGaM86AbbdI5izjiivgqqt

ghx3g7LPDaoDx48fTp08f\nKioq6utRV1fHxIkT6devX+vrllVivU+Us0ZEREREJL8UrJGy

UawPuDcdSsGrT4/n38Oo0bBP/8J\nO+0UgjSbbMKMGXD55WFx//5w1lmw5po5rEcrF

fr4jVGwRkREREQkvzQMqoyUe84Mta+05aR9770H\nxxwD668Ps2fDK6/A7bfz6bKbcN

JJsO668MMP8NprcP31TQdqWqvcr5+lililiOSPgjUiUnqefx72\n2gu23hpWXhnefx+uvJI

P5/Vg4EDYaCNYdFF4+20YPRpWW63QFRYREREREcmbHkFJ2SjWISRQ3HUr\nBh

mdn3nz4KGHYPPhw+OQTGDIEjjwSOnXinXfgoovg4Ydh0CA46SRYdtkc1SOHCn38xm  
gYllililhl\nfnfUodAVERJo0Zw7ccQeMGAGLLAJnnngn77gsdOjBpEIRXwzPPhADN6NGw  
1FKFrrClililiEjrKFhT\nRmpqaqisrCx0NXJG7Wv9/hN5VZKPVVIzmnZfzmnX7vv8+ZAa+/  
HJYZ53wvv32YMbzz4cgzaRJcNpp\ncPPN0LizzqqekXK/P0VEREREJH8UrBFZSCQH  
ZcyeBPifvEFXHEFXHttCM6MGwe9euEONTVwwQXw\n4YdhZqd//xs6dix0hUVERER  
ERNqWctZl2SjWfB9QfHUriyvq89x5ceincfTccfDCceiqsvjru|RfN\nnBRfAN9/AX/4ChxwSR  
kTIpB7KWbMA5awREREREckv9awRkcJ66SX+DdCnDwweHKbjXm455s2D++4J\nnw5  
3mzoWqqpCqpn37Qle4bSUPT+vbty9Dhw4F8jc8TUREREREio961pSRcs+Z0Vz7irVX  
AmRWt3xe\nnv0Kcqwbts3SXGT4cams58aOPuOKHH6BzZ+bOhbFjw+xOnTvDOefAbt  
Bu3a5r2Nrzks5//7Us0ZE\nnREREJL/y8PgjlhL9+ivceitstBHfHn88sw85BD74gCuBXzp0Z  
tSoH1lldn8858wciS8+CLssUd+\nAjUiililiLFQj1rpGyUes+afMp7fX74Aa67Di67DNZcE  
844g7revak65xzOOaeabt3+Srduo2jf\nfjL/+Mcq7LrrEvmrW5Jiu07FQj1rRERERETyS3  
+vFpHcmTEjjGPq0QOeew7uvReeeAJ22on2HZZm\n+eUvoWdPA7Zlyy1H8Oab3QoW  
qBERERERESkWCtaUkaKdirmNqH0IZMoUGDQI1l0XZs6E55+nZvBg\n+P3vmTULzjs  
PVI8dJk9enHvu+QHYm0suOYCKiopC17zFyur6iYililhIQWUcrDGzxc3sSDO73Myu\nN

LPrzeyfZnaZmR1gZgr8iCzsXn4Z9tsPttwSII0WJk+GMWOgZ09mzQrTbvfsCR99BBMn

wtVX1/HA\nAxcCMGLECOrq6grcABERERERkcLLKGeNmW0PrAeMd/cPU9YZsBGw

HfCEu7+Ri4q2FeWsKV/FnG+k\nn2OrWpvVxh0cfDTM7TZkCp54KRx8NXboA8OmncM

kIcMstcNBBcMYZsNpqUFdXR1VVFdXV1Sy99NLM\nmjWr/nuhetgU23UqFspZIyliiKS

X80Ga8ysl7Cyu09pdmdm67v7221VuVxQsKZ8FfODdrHVrU3q\n8+uvCNddIUgzb16lw

hx4ICyyCABTp8KwYXD33XDkkTBkCKy44vzNx48fT58+faioqKivT11dHRMn\nTqRfv36

tq1sLFdt1KhYK1oililil5FezQ5fc/efGAjVmtlHsWZMoW9SBmnJX7jkz1L4iMXs2jBoV\nnxj

Nddx1cfDG8+SYcdhgssgjvvguHHw69e8Nyy8H774eeNe+9V9NgN/369VugB01FRUXB

AjWtVTLX\nT0REREREil7WeWbM7HAzG2ImA4DZwEFtXisRKT5ffQV/+xt07w7PPBN

61UyYALvsAma8/nplV1NZ\nCWuvHUZEEXXBBSF0jlililimcs0Z02DDcwOBx4EtgD2A

D539/NyULEc0DCo8IXMQ1iKrW5Z1Wfq\nVLj0UrjjjhCNOe00WHPN+tUvvADV1fDqq2

HVwIH16WpyU58cKpZ6FBsNgxIRERERya8OLdjma2CO\nuz8EPNTG9RGRYvHqqzB

iBPz3v3DssfDOO9C1KxByCj/1VOg588EHcNZZITdNx44FrrOliliEgZ\naMI02zsDD5rZ

PWZ2ppn1butKScuUe86MUmvf+PHjF5iKuq6ujvHjx6ctXxTtc4fHH4ftt4f+/UPi\nnmWnTQ

teZrl1xh4cfhq22Cj1oDjkkDHcaNKj5QE1RtC+Nmpoahg4dytChQ+nbt2/952zrW6ztExE

R\nERGR0tOSnjU17n6imXUCfh9fL7VttURKX58+feqnooaGU1UXnblzQ9eY4cPDLE+J  
mZ0WXRQIkz2N\nGxdIInnPmQFVVGBHVvn2B690GKisrqaysLHQ1RERERERE6rUkZ  
81ewKfu/nJuqpRbyllTvoox30gi\nQDNmzBgGDx5MdXX1AjMgFUL9uZo9G268MeSkW  
XXVEKTZZRdoFzrdzZ0Ld94JF14InTrBOefA7rvX\nr277+khRUs4aEREREZH8akmwZ  
mT8uAbwM/CUu49u64rlol15atYH/hra2vp0aMH06ZNo3v37gWr\nx/jx4+nTpw8VFRUs  
a8bX557LvKuu4ss116TrZZfBFIVUI50zB265JczK3a1bCNLssANYjh7Xi/Xa\nSaBjYilih  
lfrXk7+P3AP92992Bw4EX2rZK0ILInjOjFNtXV1fHiBEjABgxYsQCOWyS5bp9ffr0\n4bIT  
TuCXgQN5H/iltpa/77ADHR96qD5Q89NPMHo09OwZRkXdcAM8/TTsuGPrAzWleP2yU  
e7tExER\nERGR/Gk2WGNmi5nZsonv7v6Muz8bP//k7q8kIV01N9UUKT2pOWqqq6upq  
qpqMmCTM5MmUTFoEEMfneoiaV15hfeDUzp05acwYKioq+P77MPHT6quHyZ/uuQc  
efRT+9Kf8V1VERERERGRhl9EwKDPbDVgS\nnuM/df0qzfmIgP+Bdd3+mzWvZhjQMqn  
wV21Ca5GFHibrV1dUxceJE+vXrl/sKuMMTT4Skwe+8Ayef\nDAMHUjtZv2wrKWW6s  
6VV4beNNtuC2efDRttlPuqpSq2aycNaRiUiiliEh+ZZyzxsxWBP4MLA90\nBBYBfgN+B  
D4F/unu3+aonm1GwZryVcwP/Hmt29y5oWvM8OFhXNMZZ8DBB8OiiyYIPL6LzTb7F9  
Om\n7cCee7bjrLNg7bXzU710ivnaiYI1liliL5\nnHOGnf/3N0vdPeT3f3/3P0odx8Yv19SCo

Gaclfu\nOTPUvmb8+COMGROiLldeCUOHwlvwYAB9YGak04ajvulwHtsskkl/fqdy+WX

1+UIUKPrJylilili\nkpk2noBXRPLum2/g/POhRw947LEwjOzzzaYY3vaNDjooG+5//4L6

Nixl7AB11+/GFdeOYSJEycW\ntv4ilililiLSQNZTd5c6DYMqX8U8ICYndauthcsvh1tvhb3

2gtNOg3XXbVBk8mS46CJ48EH4v/8L\naWuWW674zlWx1Uca0jAoEREREZH8Us8ak

VLzxhtwyCHQqxd07BiGOI1/fYN AzRtvwP77h9mc1lwT\nPvwQqqtDoEZERERERESK

W1bBGjPb38yWjJ//amb3mdlmuamaZKvcc2Ys1O1zhwkTYOedYZddYOON\nYepUGD

YMunWrL/bii7DHHqHI5puHluecAxUVua9/cxbq6ycililipKFbHvW/NXdvzOzrYDt gOuB\n

q7M9qJntbGaTzewDMzuzkTJXxPVvmNmmKevam9kkM3sgadkyZva4mb1vZo+ZWRE

8noq00m+/wd13\nQ+/eMGgQ7LdfSEBzxhmw1FJAiOM89RTssEPoTbPzziFIM2QIdOI

S4PqLilililh1rLKWWNmr7v7\nJmZ2MfA/d7/NzCa5+6bNb jx/H+2B94DtgenAy8BB7v5u

UpIdgePdfVcz2xwY5e5bJK0/FegFLOHu\nne8Rlw4Gv3X14DAAt7e5npTm+ctaUqWLOe

5J13X76CW6+GS65BJZfHs48s0HCYAhBmkcfhQsugBkz\n4C9/gUMPhUU XzUF9cqzY

6iMNKWeNililiEh+ZduzZrqZXQscADxkZh1bsl/ewBR3r3X3X4GxwJ4p\nZfYAbgZw9xe

BCjNbAcDMVgZ2Ba4DLN028b1/lvUSKbyZM0P0pUcPeOghuOkmeO452HPP+kDNvH

Iw\n333whz+EnMLHHQfvvgtHHplZoEZERERERESKW4csy+8H7AyMcPdZZrYicHqW+

1gJ+CTp+6fA5hmU\nWQmYAVwej7IkyjYruPuM+HkGsEKW9Sp5NTU1VFZWFr oaOV  
PW7fv4Y2pOPZXKJ58MgZknn4T11mtQ\nZO5cuOsuuPDCKFf4nHNCfpp2JZImPPX61  
dTU1Od56du3L0OHDgWgsrKyJK9zWd+fli liliKSV9kG\naxKBmQ3N6ju1OPBYFvvIdKx  
Dapd7M7PdgC/dfZKZVTZ6AHc3M42pkOL3v//BiBEwfjxsvz28+Sas\nvHKDInPmhNm5  
L74YunYNI6N22gmsxAellGpQRkREREREJNeyDdbMZn6wZXFGN+CdLPcxHVgl6fsq\n  
nhJ4zTZVZOS7bB9gj5rTpCCxpZre4++HADDPr6u5fxB4/XzZWgQEDBtC9e3cAKioq2  
GSTTeofGhN\n6S/F75WVIUVVH7VvwRmCampqwJ3Kdu1g2DBqXngB9t2Xyg8/pLKil  
qyfMoXKykp++gnOOquGsWNh\n440ruf56mDcv7C8Rq2yT+uTp fJT y9VvY2pf4XFtbi4ili  
lil5F9WCYYX2NhsMeAxd++bxTYdCAmG\nntwM+A16i6QTDWwAjkxMMxzJ9gdPcff4fT  
jwjbsPM7OzgAoIGF64FHOSWjPD586FceNg+HCoq4PT\nTw8ZgTt2bFD2hx/gH/+ASy  
8NK0BVVYX3Nq9PkZ4rKT5KMCwilili k+tzXbRmZBLJmPuPhc4HniU\n0CvnTnd/18yO  
NbNjY5mHgKlmNgW4Bhjc2O6SPI8M7GBm7wPbxu8LIdReE+WmZNv3888cA7Du um  
HI\n01lnwTv v wNFHNwjUPPhgDX//O6y+Orz8MjzyCPznP20fqCmUkr1+GSr39omli lISP  
5kNQzKzP6X\n9LUdsDxwfrYHdfeHgYdTII2T8v34ZvbxFPBU0veZhOnARYrDrFlw9dV  
w5ZXsAXDddbD11gskm/nq\nK7j8chg9GvbeG55+GtZZpyA1FhERERERkSKQ1TAoM

+ue9HUuMCNOv10yNAyqfBXN0J5PPoGRI+HG\nG2H33eH007ENN1ygbp99FpIF33Q  
THHAAnHFGmLE7H4rmXEIJ0DAoEREREZH8ymoYILvXJr0+LbVA\njUhOvfUWHHEE  
bLwxuMMbb8DNN8MGGzQoVlsLgwaFxe5hQqirr85foEZERERERESKW0bBGjObGN9  
\nMLPvU17f5baKkqlzy5IRIO1zD+OWdtstTL299trw4Ydw2WWwyioNir73HgwYAL16wd  
JLw+TJYfjT\nSjHrU1G2rw2pfSlililipnJKGeNu/eJ711yWx2REjFvXsj+O3w4fP01nHYa/  
PvfC8zsBPDmmwBj\n2XprOOEEmDlIBGtERERERERE0skoZ42ZDYkf0xZ298vasIK5p  
Jw15SsveVh++QVuvTXM6rTUUnDm\nmdC/P7Rvv0DRl16C6urw/sUXp/H995fQpUjCh  
cpZl9IQzhoRERERkfzKNGfNEkAX4PfAIMJ03SvH\nnz5vlpmoizRs/fjx1dXUNItXV1TF+/P  
i2PVBDHQwbFhLL3HsvXHMNvPgi7LPPAoGap5+GHXeEffcN\n71OnAlxaNIEaERERE  
RERKW4ZBWvcfai7nwesAmzm7kPc/VRCoGa1XFZQMIfuOTPSta9Pnz5UVVXV\nB2z  
q6uqoqqqiT58+bXPQ6dPh9NNhjTVCAuFHHoGHHoLKygZTcLvDo4+GmbmPPDLM7j  
RICHx3HCy+\nneGaHWhivXzkp9/aJililiEj+ZJSzJsnyQPIMUL/GZSIFUVFRQXV1NVVV  
QBUVVVRXV1NRUVF63b8\nzjthXu1x48IMT6+9BqstGJecNw/uvx8uuAB++gmqqmD//  
aFDtr+sPKipqaPKPTt25ehQ4cCUFIZ\nSWVIZcHqJSllililg1ILOmvrBZFXAAcC9gQH/  
gTne/MDfVa3vKWVOeamtr6dGjB9OmTaN79+4tn39HEiWG404svhmzAgwfDMsssUO

y33+Cuu+DCC2HRReGcc2DPPaFdI33VICNGSply1oililil5Fem\nOWsAcPdq4M9AHTA

TGFBKgRopT3V1dYwYMQKAESNGLJDDplmJmZ369IHDD4ddd0Ha2hCBSQnUzJkD\

nN9wA664Lo0eHyaBeeQX22qvxQI2lilililhINrJ+vHT3V919pLuPcvdJuaiUtEy558xI75

Ejprq\n6mqA+iFRGQVsfsvkIRF7WXx/+/nc4+WR4/30YNGiBRDM//wxjxsCaa8Id8C118

Kzz4a4jrVRf4OF\n8dfEIR0AACASURBVPqV3Jvn4ililil5E/WmTXMbBmgJ9Axsczdh

27LSolkauLEiQ1y1CRy2Eyc\nOJF+/fqI3+jbb8NsTqNGwYYbwIVXwTbbpl26/PBDKHrp

pfD734ehT5tvnssWiYilililyMIu25w1\nnxwAnEmaFmgRsATzv7tvmpnptTzlrylezeWE++y

wEaK67DnbeGc44AzbeOG3RuowzOmKK8LET2ef\nDZtsksO6iRQx5awREREREcmv

bldBnQT0BmrdfRtgU+DbNq+VSFuaPBmOPho22CCMZ3r1VbjtrSB\nnmq++CjM69ewJ

H3wATz8detO0JIAjlililik01sgzU/u/tPAGbW0d0nA2u3fbWkJco9Z0bW7Xv+\nneejfH/r2h

VVXDdGXUaMgzWxRn30GQ4bA2mvDN9/ASy/BzTfDOuu0SdUzoutX2sq9fSlililikj/Z\n

5qz51MyWBsYBj5vZLKC2zWsl0ILz5sH48WGapunTQwTm9tuhU6e0xWtrQ9GxY8NE

UG++CSuvnN8q\ni4ilililiCTLKmdNgw3NKoElgQp3v6UtK5VLylITpubMYcBii3HTeuvBY

ovBmWfCPvtAh/TxyPff\nh4sugvvvh4ED4ZRTYPnlc1c95ayRUqacNSlilili+ZVRzxoz6wl

cC/x/e/ceb/WY/n/8dVVSKSrR\nUSTUiJHDOFZ7O4TBL6aRmaFkahjjkJgRpuEbY6Nhn

A2GIHNE4xjC2EqZpqFGpkJJCaWio0O79vX7\n4/6sbe3VWnuvfVyH3s/HYz/WXp91f+7

Pda/P7rCufd/X3RV4H7gHaAUUAQuAnEnWSJ5Zuzbs033r\nnrZwOYZnT0Uen3E/7vffg

uuv9dfhwgthwQJo1apeIxYRERERERGpULo1ax4C9gXeA44G/gVcDJzu\n7v3qKDap

onyvmVFufMuWwRVXwO67h4LBzz3HcQDHJM0UTNzZihfc9xxcOCB8PHHcNVV2Z

Wo2aru\nXx7K9/GJililiEj9SbdmzR7u/mMAM7sP+ALYNVZsWKTeFpgh3HQTPPUUnH

56yMJ06ZKy+ZQpUFQE\n8+aFnboffxyaNq3HeEVERERERESqKK2aNWY2y933T/U8I

6hmTY6aMSNUAp46Fc47D84/H3baqVyT\nWF0Yd3j1Vbj22rDL0+WXh+LBjRtnKHZUs

0Zym2rWililijUr3STNZuBb+IONQVis2rc3bevg9jq\nhJI1OcQdJk0KSZrFi8POTkOGwH

bbJW1u1oBnninl2mthwwYYORJ+8YuUNYbrlZl1ksuUrBERERER\nqV9pfYx194Z1HYj

UXHFxMYWFhbXeZ6wWR3z/hYWFTX6tMhs3hr20b7wRGjYMOzsNGEDxW29RmCR

R\ns3kzTJgAMJurr4Y//SnUp2mQbkWmLFEX9y+baHwiliiliLpyYI5B5LN4pMyZla3RVT

XrYP774db\nboG99oK//hX69k25s1NJCTzySNiCu00bgMt5551JqZqLililili5IS0lkHIEy2

Dqr46W8qzfDnc\nfvce2/YdnvEiLBIUwrffQdjx8Lo0dC1a5hJU1gIDRpk71ljLYOSXKZIU

Cliiili9UszayRzPvo0\nzJ558kn41a9CEeGuXVM237Ah5HNuugkOOCDs7HTYYfUYr4ili

iliEg9yLGqHIKROI2iVJtmzoRT\nT4XDD4edd4b58+Guu1ImatasCdtvd+xYzNtvw4svwg

sv5F+iJmfuXzVpfClililulRsksbqhzu8\n9BlceWRI1PTuDYsWwTXxhIRNEitXhiVOXbvC  
Bx/AbbeFQsL75+Sm8SlililiLpUc0aSVu16q6U\nIMATT4TtyHs7HTaabDNNiP+eKLs  
DrqqQdgwlBwyu6711F89SSbYxOpjGrWililijUL9Wskbqx\nfv0POzt17RqSNccdl3JnJ4  
DFi0Ozxx+HQYPgvfegU6d6jFIEREREREQkC2gZVB7JipoZX34JV14J\nXbrAtGlh3dl//  
wnHH58yUfPhhzBkSFje1KIFzJsXljwlJmqyYnx1SOPLbfk+PhERERERqT9K1kjtnWLg  
QzjsPunWDFStg+vSQqDn44JSnzJkTNoE64gjYdVdYsABuuAHatq3HuEVERERERES  
yjGrWSNqS\n1I15552wdun11+Hcc+HCCyvNtscyGXZ3+te/4JJL4He/CzNq6iS+LJHNs  
YIURjVrRERERETql2bW\nSNW5w+TJcPTRcMopcOihYWena6+tMFEzdWpYDdW/Px  
x1FHz8MYwYUTuJGhEREZFcYWa7mtmTmY5D\ntmRmF5rZoEzHISKiZE0eqeuuaGQ  
0BHnssFJf5/e/hrLNCxuXii1NmXNzh1VehoCA0//nPw3KnYcOg\nWbOqXT/fa4JofLkt38  
cnliK1w8x2Ap4ALs50LJLUncAvzewXmQ5ERLZuStZl5TZsgDvuYAHA3/8O\n110Xtmo  
aNCjlFtzu8NxzcMghcNFFcPbZ8MEH4XHbbes1ehEREZFs8hhwg7t/FjsQzeaYb2alcV8  
L\nnezSuDajo2Ox1783s3fMbEh852Y2zow2Rm1KzGyGmbWpapBm1sHMPjCzZ2oyW  
DP7m5I9HMWzuCZ9\n1TYzOzp6f2Lv1ylRvYQzgVFmtItml8xOZnZ89HM23czeMrNnz  
KxHffRVjfbHmNmLZvZm9Gdsgpkd\nVoX4DjezuVUdVz7lsfvc18xeMbMp0Z/p8WZ2QB

Xiy8777O5b1VcYsqTlly/dr7rKfaed3Pv394PT\neO82bXIfP959333de/Z0f+op982b6yF

Wd8/me5vNsYIUJvr5zjf3/rSI770letfhCTA6xW8/g5Q\nCsyqoM1nwGbgZxW0OQP4CO

hag1iPj2K5uxbGvWvU1yNVPO9Y4EugUx3fl+eATUDruGPDgNcy/TOT\nbV9Av+i9Oi3

u2EhgDXBAXfZVjfYDgWeA7aLnLYAJUR8XphFfl+C/wMeZft91nytsfxYwHegYPW8!\nT

Iz6GJTL91kFhmVLH38MN98cljydeir84Q+w114VFsktKYFHH4Xrr4fWreFPf4ITTk5W3

edyOYi\nvtkcm0hIVGBYRKTwzKwRsAAy6u6vp2jzEnAc8Ja790nR5hOgM3Cyuz+fos1

NwOPu/k4NY27n7stq\n0kfUz2nAeOB37n5vFc4bD5wKtHH31TWNo4LrfAGscPcfxx3b

DlgCnOLuU+vq2rnEzFoA84CP3P3I\nuOMNgMXACuDAdD5sVbWvarRvB7wBHOTuG

+LaNwU+BnYCDnX3/1QQ4yXATcAn7r57ZWPKFzl2n1sA\n/yMkcVbGtd8PmAWsAzrE

/wwkiTFr77OWQeWRGtfMePfdsJf2wQfD9tvD3Lih2dNee6U85bv4O67\nYc894aGHw

vfTp8OJJ9Z+oibfa4JofLkt38cnlil1NoCwE2vSRE3kq4o6MLNOQGw3h9Yp2nQBmtc0\n

UQNQG4maSEH0OKWK5x0BzK3jRM0ehPf0zfjj0Ye7B4DL6uraOehUoAPwePxBdy8F

ngR6Ar3rqK+q\nntj8LGJ/4ld3dv43aNwAuSBWcmXUAjiQkCLKWmbU1s3/Vcre5dJ+PA

DoByjRc94PosTmwd6rgsv0+\nK1mztfOoAnDfvtCvHxx0UNjZ6brroF07XnxzRVavLv/v4

+rVq3n66Ze55Rbo2hVeeCFMwvnnP8Mu\nT/U5m0ZEREQkR5wOvFhJmwqTNcANQ

CyB0ipFm5HANVWIqz4UACvdFV66J5jZrkBHoK5ntfSKHt9M\n8to/gWPNbIc6jiFX9lsek  
81GmRU9nIRHfVW1/SHAH83sT0naz48e960gvtGERF22f7Jpyg8J3NqS\nS/c5tmVNXz  
OLT2A3ift+TQXxZfV9VrlmjxQWFqbfeNMmGD8eDjwQhg+HgQPD8qff/77czk5HHHEE\\  
nI0eOLEvYLF68muOPn8Lvfncs06bB88/Diy/C4YfX8mCSqNL4cpDGI9vyfXwillJ9ZrYtc  
AyVzyz5\\nuol+ehFqMLwdHdipiZo2ZHQR84e6fVzPUWmdmOxJ+s/1WFU89Inqs6n\\VV  
VGyZjrh89IJdRxDrfgP\\ncMLysERL4trURV9Vbd8Q2AY4LUn7RnFttmBmfYGI7p59BWf  
rRy7d55eAF4Db3T0+2R1LxH3i7h8m\\nCywX7nOjyptlXvnmGxg7Fv76V+jUCa65JhSX  
aZA8b9eyZUuKioq45JLrgGvo3r0R/fodzwMPNGDv\\nIBPKRERERCTOAcC2wHu\\VtEs6  
syaq1zAa+AVwRXQ42TKoS4GhKfo4jLBd+M6EBMT3wLDE2S5mdj0h\\nsbQNcl67/ztFf  
wacDQwBSoC10bV7Av919y+iprHaO2+Z2UDg10BjoA1hV6wH4/rsC/wxehr7sHWO\\nm  
Z1DSEKdXt1xRW1PAy4i/Ba9BLiQsKRinruvSGzv7muiHWIOJWFZRjoqey+jGkVL3f3sq  
vZd36Ka\\nS52jp8l+TmPH2tV2X9W89mhCXZrbk7TfP3rcYvZGIFgdwQ8zPCpkZmcSIIw  
1JRTD/k30/V3R4xpC\\nMeOsSaBWJNfuc7SsLdm9+kX0eHmK2Kp0nzNFM2vySIU1M1  
auhKuvht12g9deC9WAp0yBk05KmagB\\nWLYMiopaMnHi9UBbXn55NU880TgjiZp8rw  
mi8eW2fB+filjUSNIveStpl2oZ1NnAVHdfGtem3Dlo\\nMzsJmOLu6xOOW5Q0+Adwn7sX

RsWLrbuTWj7G2Ctu/+EsJvUzcmCMbNtov4uBwa6e+/o++eBSYQ\lnXzGxejXHEZY1

HRu1/xswxszKiiO6+6vufmRUWPRr4IPY88RETVXGFbW/CRgDXOzuhwO/BO4D9iT5\

nrJqYJVS8XCapyt5LM+tKeE9yZQeKFoTPjpuj+iGJvo8eW9ZBX1W+trtPc/fD3L1cks3M

WhLqopQS\ngfYTXQbcESUBKhQVpt0DOMbdDyPMfHsi6vcc4P8IM8RGVNZXFsmpl+

5yMmR1LSApf5O4TUjRL+z5n\hkmbW5LtPPgk7Oz3yCPTvHxI03btXetqSJfCXv4RaN

AMGfE+/ftfw8MPX8eST57HffkW0bJnOn08R\lnERERIWxdvdndv6mk3RbJGjNrRZg5cn

B0aFX02DquTUPCDJcBSfq8hvBh8bCEmR3LCLN9Yn00lmyV\ne2x0qHuyeCJ/A04ED

nb3BQDuPsfM5gMHAvEFT2Mza15y91vjjn9A+GDWEyi3TMHM2gNdgftTXD/t\ncUX9/

QG4BDgz1tbdrvCzYuAnVJys+RrYp4LXt5DmexkrklrtmjxmNgQYVM3TS4HfuPuiNNtvF

z1u\lnSvH65ugxnf0+Ve2rNq89jFB09nZ3zfz+hSiBto+7V1rzKSrk/RN3/1Xc4f8BfwJ+Hf18

XUaY3TM7\njbiyRU7e5yiB/Clh4bMfcCshObuFqtznTNPMmjxSrmbG7Nlw+umhJk2zZv

D++3D//ZUmaj76CIYO\nhZ49Ybvt4F//WkOjRpdw++2XAIBUVFSuhk19yvealBpfbsv38

YmISI20pOlilzHJkiNXA/e4+9qE\lnNvHLoH4NPOLum+NPNLOehGVF/4glKcsJzP7JfA

UMCqueR/CzBjMbF+gB/BsYjBmVkB7jTR3Wcl\lnvNwa+BaiXWsHwgenfyUkaiDMskk

15liCJ2mNn6qMy8x2lyR2Zrl74o4xO0WPISVrqIpgOP697EI4\lnL59J0gaqvkNWGXd/IG

7mUVW/jq5CogZCcqcisUKvIbWrTI+1cm0z25vvc/MclXmX6AbgD5VcK2YQ\ncH3CsR

6EhMI/oueXAz3dfVyafWaDnLzP7I7i7sdGM5zaEhKki8zs+CT9VOU+Z5Rm1uQTd3jjD

Rg9\nOiRnhg8Pe2nvUPm/L++/HzaAmjwZLrgAFiyA1q3hxRffojoh5k0sRo206ZN48QT

T6zrEYmliljk\ngybAhkpJSQuzGwf4HjKbz1bbhmUmTUDjnP3ZLNqLiDUZ9nLzN4ifMj5

iIA491h3/zLW0N3/Sdj9\nCElypgR4OEmfsa2syyU+otk9vQiJmZLocO/o+k8n6acX4YPtz

CSvxRIZqWadpD0uQI2aJonxRgqB\nDyvZonwNYSZG2hLey7NJ/I72JtSrycotg5NYV8n

rsQ/S6ytsVb2+anxtM2sOjCck0X6VuMzGzH4O\nvOPuyQrbJvNndy9bwhbVcOpNSAQU

BXD374A5afaXkpkNJtTFSaYJ0M7M3kjxuhNq5vvvzcvl9H0G\ncPd1sTpXwLNmVuDu/

4Jq3eeMUrImA4qLi8vqWxQXF5f9Rr6wsLB6v53fvBmefpriK6+ksEEDuPRS\neO452Hb

bSk/9z3+gqAjefhsuvhjuuQe23/6H15MIZFq2bJmRRE38e5WPNL7clu/jExGRGvmOUF

S3\nMom7Qd0GXOXu8csCEpdBXUKK2jKEZIQTkjfpGhTjpk1BgYCkxKL7kYfeI8hJB9

eTzj1AMIShPhZ\nKrGks3FCP7Edlqa7e7IZR32ATytIZBSS/rhOi9q+IBBDZ2A3Qt2aijQ

m3L8qjy2HAI5195Vxx9sR\nlnlVuWhxpKQfgNfyw1KVRLHjFSW+qtVXTa8dJRKflBQUH

hqfZlle345QYybd7ahJ7AP4MaFo9th0\n+6jCtR4EHkz2WrTFfXFU56k2rpWz9zh2ivNb

AZwOHAtcEx17nOmZSRZE01HupWwXdr97j46SZvb\ngZ8C3wBnufssM2tC+AdgW8Jf

nM+6+xVR+1GE6tuxf1SucPeX63os1RGflDGz6hcm/fZbGDcObroJ\n2rWDM8+EK66os  
GBwzFtvhSTNnDkht/Poo2G1lliljUutWk/gASr2xmTfQb4BbuPj5Fmx3MrC3Q\n1d2vTd  
FfJ2B1uomayCmERNADSV7bi/D5YVaS+juF0WN8sqaAsEvUuwItexOWKvw58QJm1p  
qwnOSx\nhOM7xSWP0hqXmbUgLLda7e7zE16OfbitaAkUhPuWckv1SvQCdiRsLRyvx  
vVqMmQucliZtXT3xJol\nbaPHj+qor5pc+zbgM3c/J/6gme3r7nOAwwi7iU0OE2TK6Qhs  
pu5cqG7v5/kGkdHj6lmuNSVLQKu\nBTIzn81sOKFW12Xu/lZC+6XRY6zeV23c53pV78  
maKLN5JyEr/xkw08ye87jt9czsBGAPd9/TzA4B\n7gYODffvzOxId/8myIS/ZWZHuPs0Qs  
b8ZndP9ZuF/PHVV/C3v8Gdd8lhh8BDD8ERR5T9C5mKO7z+\nOlx7bSggfPnl8MwzaU  
3AyQr5PmtB48tt+T4+ERGpkcVAczNrViGRYXcvMbP1hC1/byQUDU4US9Y0\nBP5CK  
oRHQtuNqV40sz2AIQkfoYSfnP9YtTmCeCX0UyChIGbcgWBI4WE3Vpiyw2aE2bbvJJk  
FsKg\nKK7xUdu7gT+5+ypCggPiarnEPhvwwzbMaY2LHz7lpooXomSNmT3p7qcladeB  
ynfxSiW2fC1xqVdl\ny7zSYmZDCbOgqqMUONvdP67COVMJ25jvAyR+MI4VYU63Bk9  
V+6rWtc3slqC5u5+VcNwIMy5OdvfX\n+GE778TzSwmzvl5MON4OaBy3nOZowrK+txL  
aTXT3/sn6zmK5dJ+LCH9fXpKkfWwqwmqA6tznTMtE\ngedGdQXu/km0nnU8cHJCm3  
5EU73cfQbQMvrNAXH/wDUm/IMRn+mui8xi9li8ONS h2WMP+PjjUJ/m\n2WfhiCMqPM

0dn8eDj0ULrwwFBD+8EM455zcSdSlilil5LBY3YouabT9mrCj0lx3L07yenxdmzUe\n7c  
aUwsuEehZNE1+ICu/+nbjPA1H9m6OBJ929NNrx5qu4ZMtckiwJMrMDo/P+7e6x7XUP  
J/xfPdkY\nTgAmu/tXURHiHaJEDcCPosfZUd+NCDv4xM/OSWtc7v414bfrifVJ9gP6A0vc  
/TMz24nU9TK6UP26\ni7HZVLHi0LH3+ERgVRXqiCTI7mNqWGC4Koka+KH20AIJXjuJ  
kEAjV0jZzC42sylm9qOE9IXtqzrX\n/n+E2RTnmFmj+C/Cz+fnSfqqVDT7ay4wK3q+A2G  
m1qfuvj6u3QBCHaVck0v3eSmhHliyLbp7RI/P\nJ3ktJ2QiWdMR+DTu+VJ+qAZfUZtOE  
GbmmNIIsYDnwhrvPjWt3oZn918zGmFn+7C393nswaBAccAA0\nbhzWLj3wAPyo/J+Fx  
OVUmzfDk0+GnZ2uvDIsd3r//dBVoxysVITt5WI5QuPLbfk+PhERqZF3CUmO\nnnmm0/Y  
rwG/oRyV70sOPTWkLh26sr6evP0XXLdr4xs+3N7AJC8uM37h6f/LHo2h9GtWtuAa6Lu/  
YG\n4B7gaAtbimNmvyBxhF+kJi6BguTJmlJgXjS74WbCVuAxseVK30Qz8m8B7o7/EF  
zFcY0G9jez2GeJ\n/YG/En4LHyuEfAFJChBb2A74R8DbScaQjtcls+/PjsVlqFOzGzCtmn  
1mjledt/4J/DZKWABgZocR\narbc6O7LE077M2G2VLkISFXtq6rtLezC9Ti hZtB3hA/58V  
9TgbKVHclY2OIzoFX8NQn3b3vgvqj+\n0s2EbaLbmlmb6NyjgMGkrieVtXLpPhP+LE8il  
VljZkcQEeq1LCbvBpVTBfc64THxkT5wGmUriLBmH\nsn+gekYZzFfMrDD6rcPd/HAj/ky4  
cUOTdXzWWWex2267AaFYbs+ePcuWMMQ+cNX89ixLV4vKIA3\n36R4xAhYuJDCE

SPgjjsonj0bPvqlwo4dU/a/aRN89lkh118PDRoUM2gQXH55IWb1Pz49D89jsiUe\nPdfzip  
7Hvv/kk08QEZGac/fvzew1QgLj0UqarwleTPiFZLI298XNRkl13UUWttq+0cz6EX4D/R3h  
\ng01fT9jq2903mNI5hCTIYOBqd/80odtLCf8vn2pmKwmzC54i/BY7sf7LdOCdJKH9IrCE  
qw9wV3ytlnCXd/1sxulyRP1gD3unu5LcSrMi53v8vMdgZeNbPlhA/o/Qk7PD1uZjMJNXi  
S1Ro5lDA7aFKS1yoV\n1dw8E7jCzAZGMb4XvZxr9WpiBhGWyL1mZjcQlppcS5jtkOxD  
8VjgV2y5dXI1+qpK+9GE5TEVffZM\nnrGMEgJn9IPDz1zl6f3vgSzP7CjjS3d81s+slyYli4E  
53f9LMPo1ii+0CtcWuUzkkJ+6zu//dzLYF\n3jSzCYQ/3+0liezpwJIJEktAhfd5FXBUTWe+  
1QbbcgIpHV/Q7FBglLsfHz2/AiiNLzJsZvcQqlrH\n1rHOBwoS32gzuxL41t1vSji+G/C8u+  
+b5PpJls1mjplRLp7Nm+Ef/4C//AXWrg3TYQYOTGu90vff\nhw9ixYefuLI1g5Eg46ijYsn5  
SLcWaZbl5vmyOTaQy0c9vfi8zFRGpY2b2K8JvhTtV0u5nwFSP2z0o\nSZuBwIS4JUcZ  
ZWYvAH2Blu7+babjqS3RB8V93b3WtkE1s/GE2R7d3D3dlq1ZJZoRdQyhhogBb7t7\nnt  
WYfVbWv2rx2Pog+977h7ukssaxq3zlzny0UEz8G2JOwQdHb7p4sUZxTMpGsaQR8QJ  
gO+Dnwb0LW\nMbHA8AXufkKU3LnV3Q+NppVtcvfV0RrVVwgZ/9fNrL1HFeHN7GLgJ  
+5+epLrZ2ey5ttvQ6Hgm26C\nNm3gssugX7+0dnbasAHuuy+c+uMfhyRNJWVsahZrlsr  
m+LI5NpHKKFkjIJz0f+BPwbO8SzdsbQy\nZtYgcaZA9H/yZcB77t47+Zm5J7pfwm70r5

ajfOHEmYP/dbdn4qOtY76nOruyWpyiFSJhXpLz7r7\n4ZmORWpfvdescfdNhHWhrxAK

Mz3h7vPM7Ldm9tuozSTgYzNbANwLnBed3h74Z1SzZgZh9szr0Wuj\nzew9M/svYYrpX

fU3quprCWEP7S5d4IUXQi2a6dPhlFMqTdSsXQvXXw+77w5Tp8KVVxYzaVLdJGqy\n

QeKSonyj8eW2fB+filjUTPR/4KuAyZldS3WY2dHAWjNLrKXzW6AF4f/s+WQQ8EF1Ej

WR4YRIOPHb\ni19DqJdyYQ1jEwHA3VcoUZO/MIJm1t1fAI5KOHZvwvMLkpw3h7AFY

LI+z6zNGOvcp5/CLbewEOCj\nj8Ke2j16VHYWAKtWwW23hd27jz8e/vnPcKo+K4qlilhk

L3cfZ2YDzay/u0/MdDxV1J+QfFgUO2Bm\ng4AbgD+7+xYFenNVtKTiMuBnNehmETD

S3adFSzouBQYA/dx9YS2EKSJ5rt6XQWVaxpdBvf8+3Hhj\n2Et7yBA6/fWvLE0znmXL

4Oab4f77oX9/uPzysIt3fcn2pTzZHF82xyZSGS2DEhGpPdGy/knAz9z9\nns0zHky4z2xe4

EYgVUmwJfEQoV5CL2xOnZGbJgFfc/fEa9NGJM NuoOeE9mwlcFyvbICJSGSVr6oM7\n

nTJkSiga/+y4MGwbnngutWqX1IX7JkpDfefRROOMUHO4c+d6ij1Oticcsjm+bl5NpDJ

K1oi1C4z\n6wzc5O6nZToWKc/MziZsfJlm07GlyNat3mvWbFU2b4aJE+Gww+Dss+Hkk

2HRIrjiCmjVqtLTFyyA\n3/wGevaEpk1h7ly4447UiZp8r5mh8eU2jU9ERCRw9yVK1GQn

d79PiRoRyQYZqVmT9777Dh5+OGzP\n1LJI2Nnp5JOhYcO0Tv/f/+C66+CVV+D880NJ

mx13rOOYRURERERERCQraBIUbVq9Gu65B26/Hfb\nH0aMgD59wFKvHohfHvPOO

2FjqGnT4OKL4bzzYPvt6ybU6sj2pTzZHF82x1ZbrIKfc8kdyX5OtQxKlnRERERKR+aW

ZNbVi6FG69FcaOhRNPDFNi9t037dOnTQtJmvfegz/8IUzK2W67OoxXpl7ke0lq3ynh\nJ

iililiKSHTSzpibmzg2Vf599Fs46C4YPT6vy74svvsjhhx/Bu++25Jhj3mC33Y5k2LBv6NLIT

U45\n5afVDqe4uJjCwsJqn5+qz1gtvj+CwsLa/1a6cRS0TWzefZKOrHVxf2rT9n8/kt6Ut1

DzawRERER\nEalfmllTVe5hKszo0TBzJlx4YagE3Lp12qevW1fAj360gu23bwGM5d//3p

9Ro0by618X1W3sMrON\nnbQAAGnhJREFU1ZCJplylililjl1kwza9JVWgrPPRe23/7yy7

BeafDgsE1TGmlbQxUVhYTN8OEb\n+Pe/L+Oee+7ivPPOo6ioiJYtW1Y9LimTzTM7sjm

22rl1jDHfaWaNililiEh2ULKmMt9/D488EpY7\nntWgRdnb62c/S3tmppAQefxyuvx522AH+

9KdQ1sYMPvnkE7p06cKiRYvYbbfdqjcgKZNtyYJsWkJW\nH7Lt/c82jz76KA899BCvvP

JKpW3HjRvHmDFjmDp1ap3Ekqp/JWtERERERLKDIkGlsmYN3Hsv3HYb\n/PjHcPfdU

FhY4c5O8b7/HsaNC6uldt0V7rgDjj76h9NXr17NjTfeCMCNN95YKzNrcr3mSWVybXxV\

nTcrk2vhySYMGDViwYAG777572bFRo0axcOFCHn744XqJ4YwzzuCMM86olb4KCws

ZNGgQQ4cOrZX+\nREREREQkuzTIdABZ57PPwpbbu+8etmeaNAlleegmOPDKtRM03

34T8Tteu8Mwz8NBD8MYbcMwx5RM1\nl0eOpKgo1KgpKipi5MiRrF69ui5HJiJxcnnno1

yOXUREREREKqdkTcy8eTB0aNhye+NGePfdsPxp\nv/3SOn3tWrjhhpDjefPNsEHUSy

9Br15btp02bVq5mTQtW7akqKiladOm1Wgl+T4rQ+OT2hS/3Ke4\nnuJhOnTpx880307Zt  
Wzp06MC4ceMAWLRoEa1atSpre/bZZ9O2bdyu54MGDeK2224DYM2aNQwdOpQO\n  
HTrQqVMnrrzySkpLS4Gw9Kh3795l502ePJu3brRsmVLzj//fAoKChgzZky5GC+99FJat  
27N7rvv\nzssvvwzAyJEjmTp1KhdccAEtWrRg2LBhAMyfP5++ffuy44470r17dyZMmFD  
Wz6pVq+jXrx877LAD\nhxxyCAsXLqyNt1BEREREROqlkjXTp8PJJ4clTrvtBh99BLfeGt  
YupeGrr+D//i/MpjkzB157LRQS\nPvDA1OeceOKJWyx5atmyJSeeeGL1xyEiNbJ8+XL  
Wrl3L559/zpgxYzj//PNzs2YNXbp0Yfvtt2fW\nnrFkATJkyhRYtWjB//vy57FE21InnUXjxo1  
ZuHAhs2bNYvLkydx///1bXGvlypUMGDCA0aNH89VX\nX9GtWzfefvvtcjNmZsyYQffu3V  
m1ahUjRowoW/JUVFRE7969ueuuu1i3bh233347GzZsoG/fvgwc\nOJAVK1Ywfvx4zjvv  
PObNmwfA+eeft7NmzVi2bBkPPPAAy8eO1ewcEREREZEsnUma2I7O/XqBQMH\nw  
nHHwaJFcOWVsOOOaXWxfHmoNbzHHrb0acj5PPoo7LNPHcdegVgx23yl8eUBs9r5q  
gPbbLMNV111\nFQ0bNuSnP/0pzZs354MPPgCgoKCA4ujili1bhplx6qmn8uabb7Jo0SL  
Wrl3Lfvttx/Lly3nppZe4\n5ZZbaNq0KTvttBDhw9n/PjxW1xr0qRJ7LPPPpxyyik0aNCA  
YcOG0a5du3Jtdt11V4YOHYqZceaZ\nZ/LFF1/w5Zdflr0ePzPohRdeoEuXLgwePjgGD  
RrQs2dP+vfvz4QJE9i8eTMTJ07kmmuuowNtpvTo\n0YPBgorGLSlilSBbbOgsM77N

P2HJ7xAj4+c+hUfpvw6efho2hHnkETj8dZs1KexKOiGQoQdCw\nYUNKSkrKHSpKW

GbbbYpe77jjjvSoMEP+etmzZqxfv16lCRnnvuOTp16kSfPn0oKCjg4Ycfpkmt\nJvTp0w

eAxYsXU1JSQvv27cv6KC0tpXPnzlvE8/hnn9OpU6dyxxKfxydvmjVrBsD69evZeedgfJ

1\naxYvXsyMGTPKLdfatGkTZ555JitXrmTTpk3sssuZa8li0lERERERLLH1pmsueMOO

OqoKv2GfuHC\nUJPm6adDaZv//Q/iPpNlhXyveaLxSXV17tyZRYsW0a1bt7JjixYtonv37

mmdX1BQwKWXXkqnTp0o\nLCykV69enHvuuTRp0oSCggIAdtlF7bddltWrVpVLumTTI

cOHXj++efLnsrs7S5cuTXs8iUuYOnfu\nTEFBazMnT96i7ebNm2nUqBFLliwpG/+SJUvS

vpalililiNS/rXMZVPwe2pWYOzeslDrkkJCc+eij\nMLMm2xI1lpLaL37xC6699lo+++wzSk

tLee2113jhhRc49dRT0zp/jz32oEmTJjzyyCMUFBTQokUL\nndt55Z55++umyZE379u059

thjueSSS1i3bh2lpaUsXLiQKVombNHfCSecwJw5c3j22WfZtGkTd911\nF8uWLUt7PG3

bti1XJPikk07iww8/5JFHHqGkpISSkhJmzpJ/Pnzadiwlf3792fUqFF8++23zJ07\nlwcffF

A1a0REREREstjWmaxJw7vhvVSRx4JPXqEmTXXXJN2SzUMyPeajxqfvNdVV13F4

YcfTq9e\nvWjdujWXX345jz32GHvvvXdZm8qSF4WFhbRp04aOHTuWPQc44lADyt089

NBDbNy4kb333pvWrVs\nYMCAsiSMmZVdo02bNkyYMIERI0bQpk0b5s2bx0EHHcS2

2267Rdtk8V100UU89dRTtG7dmuHDh9O8\neXMmT57M+PHj6dixl+3bt+eKK65g48aN

ANx5552sX7+edu3aMWTEIYMGVKdt1FEREREROqJbW1F\nJs3MKxrz9OIQVASzZ8  
Mf/gDnnAPbbVen8dRaoc/i4uK8XkpT2fhq873MhFy/f7n+/mdSaWkpu+yy\nC4899ljZTJ  
1MSHUPo+OaiiMililiUk+UrCHUPH3jDbj2Wvj4Y7j8cjjrLGjSpF7i0QfcWqL3MrP0\nIfN5  
MmTOfjgg2natCk33ngjd999Nx9//HZ7JpMULJGRERERCQ7bJ0FhiPuMGISSNJ89R  
X88Y9h\nh6e4DWJEROrE22+/zemnn87GjRvp0aMHzzzTEYTNSlililikj22ypk1mzc7Ey  
eG5U6bN8PIkXDq\nqdCwYUbi0TKoNGkZVHbL9fdfNLNGRERERCbbJUza/bZB5o3  
h6uvhpNOgkp22RURERERERqTdb\n5cyayZOdY45Je/fuuo5HsxFqid7LzNL7n/s0s  
0ZEREREJDtslcabBqzPuDWHr2XmaX3P/cpWSMi\nlilikh20ACiPFBcXZzqEOqXxiYil  
ililyNZAyRoRERERERERkSyiZVAZUFxcXDaLIn4HoMLCwpze\nDSjTtAwns7aG9//RR  
x/loYce4pVXXqm07bhx4xgzZgxTp06tk1jqon8tgxIRERERyQ5b5W5Qmaak\nnjEj9uv766  
5k6dSqTJk0qO7bnnuy5557bnGsqKil0047LWk/Z5xxBmeccUatxFRYWMigQYMYOnR  
o\nrfQnlililiL5Q8ug8ki+1zzR+KS6CgoKmD59etmskS+++\rJNmzYxe/ZsSktLy44tXLiQP  
n361EtM\nlg3b0YmliliSFZSskZE8t5BBx1ESUKJs2fPBmDq1KkceeSR7LXXXuWO7bH  
HHjRr1oyhQ4fSoUMH\nOnXqxJVXXImW0BK3bhy9e/cu63fy5MI069aNli1bcv7551NQU  
MCYMWPKXfvSSy+ldevW7L777rz8\n8ssAjBw5kqlTp3LBBRfQokULhg0bBsD8+fPp27

cvO+64I927d2fChAll/axatYp+/fqxww47cMgh\nh7Bw4cK6e8NERERERCSjIKzJI/m+tErjk+pq3LgxhxxycG+++SYAU6ZMoXfv3vTq1YspU6aUOzZ4\n8GAaN27MwoULmTVrFpMnT+b+++/fos+VK1cyYMAARo8ezVdffUW3bt14++23y82YmTFjBt27d2fV\ninq|WMGDGibMITUVERvXv35q677mLdunXcfvvtbNiwgb59+zJw4EBWrFjB+PHjOe+885g3bx4A559\nAnPs2aNWPZsmU88MADjB07VrNzRERERETylJI1lJvzGrnqzoKCgrKEjNvvfUWffr0oX\nfv3uWOFRQU\n8NJLL3HLLbfQtGITdtppJ4YPH8748eO36G/SpEnss88+nHLKKTRo0l\nBhw4bRrl27cm123XVXhg4d\niplx5pln8sUXX/DII1+WvR5fzPeFF16gS5cuDB48mAYN\nGtCzz0/69+/PhAkT2Lx5MxMnTuSaa66h\nadOm9OjRg8GDB+d9QWcRERERka2VkjV\n5JN9rnmh8uc+9dr6qo0+fPrz11lt8/fXXrFixgq5du3LY\nYYcffp0vv76a95//326d+/Oxo0bad++Pa1ataJVq1ace+65rFixYov+Pv/8czp16lTuWOLz+ORN\nns2bNAFi/fn3ZsfizMYsXL\n2bGjBll123VqhWPPfYYy5cvZ+XKIWzatllddtmlrH3nzp2r90alilil\nniEjW025QlrJVOPTQQ\n1mzZg333XcfRxxxBADbb789HTp04O9//zsdO3akc+fONGnShFWrVtGgQcW5\n7A4dO\nvD888+XPXd3li5dmnY8iUuYOnfuTEFBazMnT96i7ebNm2nUqBFLiyhW7duACxZsiTt\na4mlnililSG7RzJo8ku81T5KNr7i4mFGjRjFq1CgKCgrKvs/FWSr5fv8yrWnTphx00EHcf\nPPN5XZ86tWr\nV9mxdu3aceyxx3LJJZewbt06SktLWbhwYdISqXgnnHACc+bM4dlnn2

XTpk3cddddLFu2LO142rZt\nW65I8EknncSHH37II488QkIJCSUIJcycOZP58+fTsGFD+  
vfvz6hRo/j222+ZO3cuDz74oGrWilil\niljkKSvrJKcVFhaWS9DEvlfiQ5IpKChgxYoV9OrV  
q+xY7969WblyZVkcC56GHHmLjxo3svffetG7d\nmgEDBpQlYcysLEHSpk0bJkyYwlglRi2j  
Tpg3z5s3joIMOYttt92ibUz884suuoinnqK1q1bM3z4\ncJo3b87kyZMZP348HTt2pH37  
9lxxxRVs3LgRgDvvvJP169fTrl07hgwZwpAhQ+rujRIRERERkYyy\nra1ApZl5vo65uLg4r  
5MUGI92M7OtuuBtaWkpu+yyC4899hgFBQWZDqdaUt3D6Lim8Yililil1BPN\nrBERqab  
JkyezevVqv/+e6677jog1MYRERERERGpCc2sEZFasTXOrLn66qu544472LhxIz169O  
D2\n2/nJz/5SabDqjbNrBERERERyQ5K1ohIrdgakzX5RskaEREREZHsoGVQeSQXd0  
CqCo1PRERERERE\nngZK1oililililZBEtgxKRWqFIULIPy6BERERERLJD00wHICL5w  
0yf50VERERERGoql8ugzOx4\nM5tvZh+Z2WUp2twevf5fM9s/OtbEzGaY2Wwzm2tm1  
8e1b21mr5rZh2Y22cxa1td4skW+1zzR+Lkb\nu1f49cYbb1TaJpe/8mV8lililiKSeFWerDG  
zhsCdwPHA3sCvzOxHCW1OAPZw9z2Bc4C7Adz9O+B\nnd+8J/Bg40syOiE67HHjV3fc  
CXo+eb1Vmz56d6RDqlMaX2zQ+ERERERGR9GRiZs3BwAJ3/8TdS4Dx\nnwMkJbfoBD  
wK4+wygpZm1jZ5/E7VpDDQEvk48J3o8pc5GkKVWr16d6RDqlMaX2zQ+ERERERGR  
9GQi\nWdMR+DTu+dLoWGVtOkGYmWNms4HlwBvuPjdq09bdI0ffLwfa1nbglilililiJ1L

RPJmnSLliRW\nKnUAd98cLYPqBPQxs8ltLhAKL2x1xRc++eSTTIdQpzS+3KbxIYililip

Kfet+42s0OBUe5+fPT8\nCqDU3UfHtbkHKHb38dHz+UBB3MyZWLSrgW/c/a9Rm0J3X

2Zm7Qmzbronuf5WI8QREakp19bdlili\nliL1JhNbd/8H2NPMdgM+B34B/CqhzXPABcD

4KLmz2t2Xm1kbYJO7rzazpkBf4Oq4cwYDo6PHZ5Jd\nXB84RERERERERCsb1Xuyxt

03mdkFwCuEAsFj3H2emf02ev1ed59kZieY2QJgA/Dr6PT2wINm1oCw\nnhOthd389eu0

G4EkzGwp8ApxWf6MSEREREREREakd9b4MSkREREREREREUstEgeF6YWYPmNI

yM5sT\nd+xGM5tnZv81s4lmtkMmY6yJFOP7czS22Wb2upntkskYayLZ+OJe+72ZlZpZ

60zEVhtS3L9RZrbU\nzGZFX8dnMsBqSnXvzOzC6M/f+2Y2OtX52S7FvRsf98Wmdms

TMZYEynGd7CZ/Tsa30wz+0kmYxQR\nERERyXd5m6wBxgKJH3YnAz3cfT/gQ+CKeo

+q9iQb31/cfb9ot6xngP+r/7BqTbLxESWg+gKL6z2i\n2pVsfA7c7O77R18vZyCu2rDF2M

zsSKAf8GN33we4KROB1Zltxufuv4zdN+Dp6CtXJf27BbgyGt9V\n0XMREREREREakjeZu

scfepwNcJx15199Lo6QzC9t85KcX41sU9bQ6srNegalGy8UVuBkbUczi1roLx\n5XwB7B

Rj+x1wvbuXRG1W1HtgtaSCe4eZGaFe1uP1GIQtSjG+L4DYTMSWwGf1GpSlililFYm

b5M1\naRgCTMp0ELXNzlrMbAlhR6wbMh1PbTKzk4GI7v5epmOpQxdGS9nGmFnLTA

dTi/YE+pjZv8ys2MwO\nynRAdaQ3sNzdF2Y6kFp2OfDX6O+WG8ntWYkililillvq0zWm

NIIYKO7P5bpWGqbu490987AOOCW\nDIdTa8ysGfBHyi/tyvIZKAnuBroAPQkzGf6a2X

BqVSOglbsfClwKPJnheOrKr4C8+3sFGAMMi/5u\nuRh4IMPxililjkta0uWWNmZwEnA

GdkOJS69hiQT0VAuwK7Af81s0WEJWzvmNnOGY2qFrn7lx4B\n7gcOznRMtWgpMBH

A3WcCpWa2Y2ZDql1m1gj4GfBEpmOpAwe7+z+i758iv342RURERESyzlaVrlI2\n17kU

ONndv8t0PLXNzPaMe3oykLM70iRy9znu3tdu7h7F8KH/wPc/ctMx1ZbzKx93NOfAVvs

hJXD\nngGOAjCzvYDG7r4qsyHVumOAee7+eaYDqQMLzKwg+v4oQoF2ERERERGpl

40yHUBdMbPHgQKgjZl9\nSlg+cwXQGHg11AHlbXc/L3NRVI+K8Z1gZt2AzcBCQIHXn

BQ3vh2j8V3l7mPjmnhmlqsdKe5foZn1\nJxtEfDbDIZYbcnuHWHZzAPRdtAbgTMzGG

KNVPCz+QtyuLBwTJKfzauAc4C7zGxb4NvouYiliil\n1BELKy5ERERERERERCQbbFX

LoEREREREREREsp2SNSlilililiWUTJGhERERERERGRRLKJkjYil\nilililhIFI GyRkRER

EREREQkiyhZlylilililiKSRZSsERERERERERHJIkrWililililhkkUaZ\nDkBEsp+ZtQc+S7

O5u3vDuoxHREREREQknylZlyLpOAFo6O6e6UBERERERETynZZBiUiFzKwZ8L0S\n

NSlilililvVDyRoRqczJwDOZDkJERERERGRroWSN5DQz22xms8zsPTObaGbNq9nPD

mb2u2qcN8zM\n5prZw9W5bkJf66M4zqtpX2leb1sze9PMrJkmLdx9fdx5e5vZv83sYTP

bKTq2v5n9z8z6mdkUM9Pf\nLSlilililtWkD1SS675x9/3d/cfAWuC31eynFVCdjMnvgGP

cfVA1rxvPgZZRn/XhDOCFipY3mdlx\nwMvxx9x9LvAi8Lq7r4gdBga4+3PAVOCUuglZR  
EREREQk/yIZI/nkX0BXADO7xMzmRF8XxTdK8doN\nQNdols7oxl6TnWNm9wC7Ay+b  
2fCE9tfHz5Axs1Fm9vvKYksWh5n9w8z+Y2bvm9nZcX1eaWbzzWyq\nmT0W6z96baC  
ZzYj6uSfFTJdfAc/GnVNgZn9KaLObuy9Jcu5SYJe45z2iJA7Ac1HflililiUg2m\nmqGSy  
8xsnbu3MLOGwJPA68AMYCxwCCEhOQMY6O6zzezAZK8BXxNmmezb5BrJzjnD3f9r  
ZouAA939\nq4RzegK3unth9Px/wLFAuwr6WgfskxiHmbVy96/NrCnwb6CAkJT6e9RPY  
+Bd4B53v9nMfgSMBn7m\n7pvN7G/A2+7+cFyfDYGI7t4+7tiOhORNobtvMrP9gCbuPiP  
Je3lc0N/df2tmRwP/c/dl0WvbAh+7\nne8dk90xEREREREQqppk1kuuamtk54AugE3Av0  
AuY6O7fuvsGYCLQO2pf0WupJDunT0UnuPtsYGcz\nax8IPb5298+q0xdwkZnNBt6Oxr  
gncATwjLtvjOrJPA/Eas8cDRwl/Cd6b44CuiT02QZYIxDzKsKs\nnmJ9Fhw5LlqiJLAV2iZI  
+O8cSNVE/3wMNzKxJJeMSERERERGRJBplOgCRGvrW3fePZp28AvQj1E+J\nL5pr0  
TEqeS2V6pwDMAE4ITCbZnx1+jKzQkLy5VB3/87M3gCapOgn3oPu/sdK4ktWWHgsM  
M7MpgKfnVXDuUkLi6GRCgidZ35q2JyliliUg2aWSN5wd2/BYYBRUQFbs2sqZltRyh2  
OzVqmuq19UCLFN1X\n1F9FniDUbjmVkLhJp691CXFsT5iV852ZdQcOJSRBpgH/L9rR  
qTlwij8kR14HTo3bqam1mXVOiG0\nnsMXOWVHB4A3ARYQiwm5+xqgNVAAazRAqEy

2D2hzNsBEREREREZEq0swayXVlszejQLgG7AOEJ9\nF4D73P2/UZtZZpb0NTObZ  
mZzgEnuflcvynPoYLZI+4+N0qkLHX35en05e5fxccBXAmca2ZzgQ8I\nS6Fw9/+Y2XPA  
e8ByYA6wJnptXIQoeHJUWLlEsNNVWaHgqJbN+2bWzd0/SAj9fqC7u5emGltkGsln\n1  
ewfi1NERERERESqTgWGRXKUmW3n7hvMrBnwJnB2VCsn3fPPAtq6+xa7X9UwruuA  
me7+j9rsV0RE\nREREZGuhZl1ljjKzR4G9CTVsxlU16WJmjYHXgAKvpb8loivQr9Zmny  
lilililsbJWtERERERERE\nRLKICgyLilililiGQRJWtERERERERERLKlkjUililililllEyRo  
RERERERERkSyiZl2lilil\nililSBZRskZEREREREREJisoWSMlilililikkkWUrBERERERE  
RERySJK1oililililZJH/D/Mi\nnetCseg29AAAAAEIFTkSuQmCC\n",  
  
"text/plain": [  
  
 "<matplotlib.figure.Figure at 0xa81d518>"  
  
]  
  
},  
  
"metadata": {},  
  
"output\_type": "display\_data"

```
}

],


"source": [

    "plt.errorbar(xdata, ydata, yerr = yerror, fmt='kx')\n",

    "#I have plotted the original x and y data points with error bars from the students'

data\n",

"\n",

"plt.xlabel('Root of voltage ($\\sqrt{V}$')\n",

"plt.ylabel('Radius $(m)$')\n",

"plt.title('Electron beam path radius against root of voltage')\n",

"plt.savefig('Combined plot.pdf')\n",

"#Here I have labelled the axis and title\n",

"#I Have also outputted the graph as pdf\n",
```

```
"\n",

"plt.line, = plt.plot([12, 18], [slope*12 + intercept, slope*18 + intercept], 'r-',
label='\"Unweighted\"\n',

"plt.line, = plt.plot([12, 18], [wslope*12 + wintercept, wslope*18 + wintercept], 'b-',
label='\"Weighted\"\n',

"#I have plotted both the unweighted and weighted line on this graph \n",
"\n",
"plt.legend(loc='best')\n",

"#I have added a legend so that both the weighted and unweighted lines can be
distinguished\n",
"\n",
"plt.text(24, 0.045, \"$(Unweighted) \\, y \\, = \\, {}0:{}1.4f \\times \\, + \\, {}1:{}0.4f\\",\n
{}1:{}0.4f$\".format(slope,intercept), size=24)\n",
```

```
"plt.text(24, 0.035, \"$(Weighted) \", y \", = \", {0:0.4f} x \", + \",\n{1:0.4f}$\".format(wslope,wintercept), size=24)\n",\n\n"\#These are the equations for both lines\n",\n\n"\n",\n\n"plt.savefig('15019455.pdf')\n",\n\n"\#This is to save the final combined graph as a .pdf\n",\n\n"\n",\n\n"plt.grid()\n",\n\n"\n#\t have added a grid so that it is easier to see where each point lies\"\n]\n\n},\n\n{\n\n"cell_type": "markdown",
```

```
"metadata": {},  
  
"source": [  
  
    "##Results"  
  
]  
  
,  
  
{  
  
    "cell_type": "markdown",  
  
    "metadata": {},  
  
    "source": [  
  
        "The weighted and unweighted values and uncertainties for  $\frac{e}{m}$  are  
calculated from the following equations."  
  
    ]  
  
,
```

```
{  
  
  "cell_type": "markdown",  
  
  "metadata": {},  
  
  "source": [  
  
    "In order to calculate the desired value,  $\frac{e}{m}$ , we use this equation:  
    "\n",  
  
    " $$ \frac{e}{m} = \frac{2}{g^2 B^2} $$"  
  
  ]  
  
,  
  
{  
  
  "cell_type": "markdown",  
  
  "metadata": {},  
  
  "source": [  
  
  ]
```

"And to calculate the uncertainty,  $\Delta(\frac{e}{m})$ , I used the general equation below which only works for small uncertainties of the function  $Z = Z(A, B, C, \dots)$ , this function can have many variables:  
"  
"\\ln",  
  
"\$\$ \left( \Delta Z \right)^2 \approx \left( \frac{\partial Z}{\partial A} \right)^2 \Delta A^2 + \left( \frac{\partial Z}{\partial B} \right)^2 \Delta B^2 + \left( \frac{\partial Z}{\partial C} \right)^2 \Delta C^2 ... \$\$"  
]  
  
,  
{  
  
"cell\_type": "markdown",  
  
"metadata": {},  
  
"source": [

"Therefore from the above equation we get:\n",

"\n",

"\$\$ \left( \Delta \left( \frac{e}{m} \right) \right)^2 \approx \left( \frac{\partial g}{\partial \Delta \left( \frac{e}{m} \right)} \right)^2 \left( \Delta g \right)^2 + \left( \frac{\partial \Delta \left( \frac{e}{m} \right)}{\partial B} \right)^2 \left( \Delta B \right)^2 \$\$"

]

},

{

"cell\_type": "markdown",

"metadata": {},

"source": [

"Which can be evaluated into a final equation which gives the uncertainty for  
\$\Delta{\left( \frac{e}{m} \right)}\$:  
"  
"  
"\$\$ \Delta{\left( \frac{e}{m} \right)} \approx  
2\frac{e}{m}\sqrt{\left(\frac{\Delta g}{g}\right)^2 + \left(\frac{\Delta B}{B}\right)^2}  
\$\$"  
]  
},  
{  
"cell\_type": "markdown",  
"metadata": {},  
"source": [  
]

"You may also note that the value for  $\frac{e}{m}$  is given as a negative, this is because the value for  $e$  is negative and  $m$  is positive."

]

},

{

"cell\_type": "markdown",

"metadata": {},

"source": [

#####Unweighted  $\frac{e}{m}, \left(\frac{e}{m}\right)_1$

]

},

{

"cell\_type": "code",

```
    "execution_count": 9,  
  
    "metadata": {  
  
        "collapsed": false  
  
    },  
  
    "outputs": [  
  
        {  
  
            "name": "stdout",  
  
            "output_type": "stream",  
  
            "text": [  
  
                "e/m = 228616372854.0\n",  
  
                "e/m Uncertainty = 41071816983.7\n"  
  
            ]  
  
        }  
    ]  
}
```

```
],  
  
"source": [  
  
    "#Unweighted\n",  
  
    "\n",  
  
    "eom1 = (2)/((slope * B)**2)\n",  
  
    "eom1_error = 2.0 * eom1 * np.sqrt(((slope_error)/(slope))**2 + ((B_error)/(B))**2)\n",  
  
    "#This is the value and uncertainty for e/m calculated by using the above stated  
equations\n",  
  
    "\n",  
  
    "print \'e/m =\'", eom1\n",  
  
    "print \'e/m Uncertainty =\'", eom1_error\n",  
  
    "#These are the precise printed values for the above"  
]
```

```
},  
  
{  
  
"cell_type": "markdown",  
  
"metadata": {},  
  
"source": [  
  
    "The rounded values for the unweighted  $\frac{e}{m}$  are as follows:  
    "\n",  
  
    "$$ \left(\frac{e}{m}\right)_1 = (-2.3 \pm 0.4) \times 10^{11} \frac{C}{kg} $$"  
  
]  
  
},  
  
{  
  
"cell_type": "markdown",  
  
"metadata": {},
```

```
"source": [  
    "#####Weighted $\\frac{e}{m}, \\left(\\frac{e}{m}\\right)_2$"  
],  
}  
{  
    "cell_type": "code",  
    "execution_count": 10,  
    "metadata": {  
        "collapsed": false  
    },  
    "outputs": [  
        {"  
            "name": "stdout",  
            "text": "  
    
```

```
    "output_type": "stream",

    "text": [
        "e/m = 209390940221.0\n",
        "e/m Uncertainty = 79668575832.6\n"
    ],
}

],
"source": [
    "#Weighted\n",
    "\n",
    "eom2 = (2)/((wslope * B)**2)\n",
    "eom2_error = 2.0 * eom2 * np.sqrt(((wslope_error)/(wslope))**2 +
        ((B_error)/(B))**2)\n",
```

```
"#This is the value and uncertainty for e/m calculated by using the above stated  
equations\n",  
  
"\n",  
  
"print \"e/m =\"", eom2\n",  
  
"print \"e/m Uncertainty =\"", eom2_error\n",  
  
"#These are the precise printed values for the above"  
]  
  
,  
  
{  
  
"cell_type": "markdown",  
  
"metadata": {},  
  
"source": [  
  
"The rounded values for the weighted  $\frac{e}{m}$  are as follows:\n",
```

```
"\n",  
  
"$$ \left(\frac{e}{m}\right)_2 = (-2.1 \pm 0.8) \times 10^{11} \frac{C}{kg} $$"  
]  
  
},  
  
{  
  
"cell_type": "markdown",  
  
"metadata": {},  
  
"source": [  
  
"####Accepted value for $\frac{e}{m}$, $\frac{e}{m}$"  
  
]  
  
},  
  
{  
  
"cell_type": "markdown",
```

```
    "metadata": {},  
  
    "source": [  
  
        "The accepted value for  $\frac{e}{m}$  from CODATA Fundamental Constants 2014  
is:  
",  
  
        "\n",  
  
        " $\frac{e}{m} = (-1.75882002 \pm 0.00000001) \times 10^{11} \frac{C}{kg}$  $$"  
    ],  
  
,  
  
{  
  
    "cell_type": "markdown",  
  
    "metadata": {},  
  
    "source": [  
  
        "##Brief Conclusion"  
    ]
```

```
]

},


{

"cell_type": "markdown",


"metadata": {},


"source": [


    "The value  $\left(\frac{e}{m}\right)_1$ , the unweighted  $\frac{e}{m}$ , does not  
actually agree with the accepted value for  $\frac{e}{m}$  because its range (uncertainty)  
does not include the accepted value of  $\frac{e}{m}.$ .\n",


    "However the value for  $\left(\frac{e}{m}\right)_2$ , the weighted  $\frac{e}{m}$ ,  
does include the accepted value of  $\frac{e}{m}$  in its range.\n",


    "And so we can assume the weighted  $\frac{e}{m}$  to be accurate while the  
unweighted  $\frac{e}{m}$  is not assumed accurate, this relies on the assumption that  
the accepted value for  $\frac{e}{m}$  is the true value.\n",


]





}
```

"\n",

"Also from the weighted, unweighted and accepted  $\frac{e}{m}$  we can say that

the accepted value has a very high precision as it is stated reliable to 8 decimal points

while the weighted and unweighted values are only stated reliable to 1 decimal

point.\n",

"\n",

"Overall if the two readings with large uncertainties (when student was distracted by

the Seagull) are accounted for by using a weighted value then the students' results

accord and are in the same magnitude with the accepted value."

]

},

{

  "cell\_type": "code",

  "execution\_count": null,

```
    "metadata": {  
        "collapsed": true  
    },  
  
    "outputs": [],  
  
    "source": []  
}  
  
],  
  
"metadata": {  
    "kernelspec": {  
        "display_name": "Python 2",  
        "language": "python",  
        "name": "python2"  
    },  
}
```

```
"language_info": {  
  
    "codemirror_mode": {  
  
        "name": "ipython",  
  
        "version": 2  
  
    },  
  
    "file_extension": ".py",  
  
    "mimetype": "text/x-python",  
  
    "name": "python",  
  
    "nbconvert_exporter": "python",  
  
    "pygments_lexer": "ipython2",  
  
    "version": "2.7.10"  
  
},  
},
```

```
"nbformat": 4,  
  
"nbformat_minor": 0  
  
}
```

FINAL GRADE

**67** /100

GENERAL COMMENTS

**Instructor**

In general, the standard of the report is good. The introduction is nice and clear, although a more thorough discussion at the end would have been better. There also needs to be more text cells throughout the document in order to explain and motivate the subsequent results and plots.

The calculated values, along with the associated errors, are all correct, although frequently values are given without associated units. Some thought has also gone in to quoting with the correct precision.

The final plot is okay but could do with being larger and using clearer markers for the individual datapoints: these are also not shown in the legend. The title could also do with being more descriptive of the experiment rather than just restating the individual axes.

There is the unfortunate habit of placing comments after, not before, the code they refer to, which makes it difficult to follow: they also tend to read like a simple restatement of what the code already shows rather than adding more information. In addition, long lines of code and comments need to be split up so that they don't extend beyond the boundaries of the code cell itself.

---

PAGE 1

---

PAGE 2

---

PAGE 3

---

PAGE 4

---

PAGE 5

---

PAGE 6

---

PAGE 7

---

---

PAGE 8

---

PAGE 9

---

PAGE 10

---

PAGE 11

---

PAGE 12

---

PAGE 13

---

PAGE 14

---

PAGE 15

---

PAGE 16

---

PAGE 17

---

PAGE 18

---

PAGE 19

---

PAGE 20

---

PAGE 21

---

PAGE 22

---

PAGE 23

---

PAGE 24

---

PAGE 25

---

PAGE 26

---

PAGE 27

---

PAGE 28

---

PAGE 29

---

PAGE 30

---

PAGE 31

---

PAGE 32

---

---

PAGE 33

---

PAGE 34

---

PAGE 35

---

PAGE 36

---

PAGE 37

---

PAGE 38

---

PAGE 39

---

PAGE 40

---

PAGE 41

---

PAGE 42

---

PAGE 43

---

PAGE 44

---

PAGE 45

---

PAGE 46

---

PAGE 47

---

PAGE 48

---

PAGE 49

---

PAGE 50

---

PAGE 51

---

PAGE 52

---

PAGE 53

---

PAGE 54

---

PAGE 55

---

PAGE 56

---

PAGE 57

---

---

PAGE 58

---

PAGE 59

---

PAGE 60

---

PAGE 61

---

PAGE 62

---

PAGE 63

---

PAGE 64

---

PAGE 65

---

PAGE 66

---

PAGE 67

---

PAGE 68

---

PAGE 69

---

PAGE 70

---

PAGE 71

---

PAGE 72

---

PAGE 73

---

PAGE 74

---

PAGE 75

---

PAGE 76

---

PAGE 77

---

PAGE 78

---

PAGE 79

---

PAGE 80

---

PAGE 81

---

PAGE 82

---

---

PAGE 83

---

PAGE 84

---

PAGE 85

---

PAGE 86

---

PAGE 87

---

PAGE 88

---

PAGE 89

---

PAGE 90

---

PAGE 91

---

PAGE 92

---

PAGE 93

---

PAGE 94

---

PAGE 95

---

PAGE 96

---

PAGE 97

---

PAGE 98

---

PAGE 99

---

PAGE 100

---

PAGE 101

---

PAGE 102

---

PAGE 103

---

PAGE 104

---

PAGE 105

---

PAGE 106

---

PAGE 107

---

---

PAGE 108

---

PAGE 109

---

PAGE 110

---

PAGE 111

---

PAGE 112

---

PAGE 113

---

PAGE 114

---

PAGE 115

---

PAGE 116

---

PAGE 117

---

PAGE 118

---

PAGE 119

---

PAGE 120

---

PAGE 121

---

PAGE 122

---

PAGE 123

---

PAGE 124

---

PAGE 125

---

PAGE 126

---

PAGE 127

---

PAGE 128

---

PAGE 129

---

PAGE 130

---

PAGE 131

---

PAGE 132

---

PAGE 133

---

PAGE 134

---

PAGE 135

---

PAGE 136

---

PAGE 137

---

PAGE 138

---

PAGE 139

---

PAGE 140

---

PAGE 141

---

PAGE 142

---

PAGE 143

---

PAGE 144

---

PAGE 145

---

PAGE 146

---

PAGE 147

---

PAGE 148

---

PAGE 149

---

PAGE 150

---

PAGE 151

---

PAGE 152

---

PAGE 153

---

PAGE 154

---

PAGE 155

---

PAGE 156

---

PAGE 157

---

PAGE 158

---

PAGE 159

---

PAGE 160

---

PAGE 161

---

PAGE 162

---

PAGE 163

---

PAGE 164

---

PAGE 165

---

PAGE 166

---

PAGE 167

---

PAGE 168

---

PAGE 169

---

PAGE 170

---

PAGE 171

---

PAGE 172

---

PAGE 173

---

PAGE 174

---

PAGE 175

---

PAGE 176

---

PAGE 177

---

PAGE 178

---

PAGE 179

---

PAGE 180

---

PAGE 181

---

**WEIGHTED E/M**

10 / 10

Quality of the calculated value of e/m for the weighted fit

EXCEPTIONAL (0)	n/a
PROFICIENT (10)	Experimental value of e/m is correctly calculated for the weighted fit.
DEVELOPING (6)	Values calculated are not those expected, but nonetheless may have been considered to be feasible.
INADEQUATE (3)	Values calculated are clearly wrong
ABSENT (0)	Values not calculated

**WEIGHTED FIT**

25 / 25

Calculation of the parameters for the weighted fit: Gradient, intercept and their uncertainties

EXCEPTIONAL (0)	n/a
PROFICIENT (25)	For the weighted fit, the gradient, uncertainty in gradient, intercept and uncertainty in intercept are all correctly calculated.
DEVELOPING (17)	For the weighted fit, one or more of the values is wrong, due to a minor coding error
INADEQUATE (8)	For the weighted fit, the parameters are clearly wrong
ABSENT (0)	Values not calculated

**UNW'TED E/M**

5 / 5

Quality of the calculated value of e/m for the weighted fit

EXCEPTIONAL (0)	n/a
PROFICIENT (5)	Experimental value of e/m is correctly calculated for the unweighted fit.
DEVELOPING (3)	Values calculated are not those expected, but nonetheless may have been considered to be feasible.
INADEQUATE (1)	Values calculated are clearly wrong

ABSENT (0)	Values not calculated
---------------	-----------------------

5 / 5

**UNWEIGHTEDFIT**

Calculation of the parameters for the unweighted fit: Gradient, intercept and their uncertainties

---

EXCEPTIONAL (0)	n/a
PROFICIENT (5)	For the unweighted fit, the gradient, uncertainty in gradient, intercept and uncertainty in intercept are all correctly calculated.
DEVELOPING (3)	For the unweighted fit, one or more of the values is wrong, due to a minor coding error
INADEQUATE (1)	For the unweighted fit, the parameters are clearly wrong
ABSENT (0)	Values not calculated

**UNITS/PREC'N**

3 / 5

Units and precision

---

EXCEPTIONAL (0)	n/a
PROFICIENT (5)	Units are present and correct throughout. Calculated quantities are shown to full precision during workings, but final results given with errors to 1sf and value to same precision.
DEVELOPING (3)	Some units missing or wrong, and/or some values do not have appropriate precision.
INADEQUATE (1)	Most units missing, and/or little effort to address appropriate precision
ABSENT (0)	No units present, no attempt to address precision.

**PLOT**

5 / 10

---

EXCEPTIONAL (10)	Exemplary plot, aesthetically perfect, publication quality.
PROFICIENT (7)	All plot requirements met:
DEVELOPING (5)	Most but not all requirements of the plot met - for example, missing legend, or errors in the axis labels/title

INADEQUATE (2)	Inadequate plot - for example missing axis labels or titles,
ABSENT (0)	No plot produced by the submitted code.
<b>CODE COMMENTS</b>	
Quality of the commenting in the code cells	
EXCEPTIONAL (10)	Exceptional level of commenting throughout the code. Clear, concise and readable throughout.
PROFICIENT (7)	Code is clearly commented where needed. Complicated parts of code have a higher level of commenting than simpler parts.
DEVELOPING (5)	Code is undercommented, or so unnecessarily overcommented that readability is affected.
INADEQUATE (2)	<b>Code is massively undercommented.</b>
ABSENT (0)	No comments are included
<b>CODE STYLE</b>	
2 / 10	
EXCEPTIONAL (10)	Code is exceptionally clear, efficient, well-structured and follows best practice throughout.
PROFICIENT (7)	Code is clear, follows best practice guidelines, with a good effort made to ensure appropriate variable names and efficiency of calculation. Runs without errors or warnings.
DEVELOPING (5)	The code runs with no errors, but is somewhat inefficient or poorly structured, or has a poor choice of variable names
INADEQUATE (2)	<b>Code has errors (requiring the marker to correct it before it can be run) - for example an undefined variable or code cells wrongly ordered.</b>
ABSENT (0)	Code would require significant correction before it can be run.
<b>TEXT CELLS</b>	
5 / 10	
EXCEPTIONAL (10)	Exceptional quality of the text commentary, resulting in an exemplary, self-contained document. Good use made of LaTeX equations where appropriate
PROFICIENT (7)	Good text commentary resulting in a clear, self-contained document. Text cells consist of complete, well-structured and grammatical paragraphs. It is clear what the student is calculating, how they are going about it, and why they are doing it.

DEVELOPING (5)	Acceptable commentary, but needs expansion in places. For example, missing explanation of how the equations were rearranged to determine what quantity the gradient represents.
INADEQUATE (2)	Not enough text cells included to create a self-contained document, or poor quality, for example grammatical errors affecting the meaning of the commentary.
ABSENT (0)	Text cells have not been included

## DISCUSSION

5 / 10

EXCEPTIONAL (10)	Exemplary discussion. Errors are fully propagated and implications fully discussed.
PROFICIENT (7)	Good discussion comparing the unweighted and weighted results. Errors in the final values of e/m are considered.
DEVELOPING (5)	Adequate discussion, but lacking in some areas, eg errors in final e/m not taken into account
INADEQUATE (2)	Poor discussion, eg one that reveals gaps in understanding of what has been calculated, or inadequate thought processes.
ABSENT (0)	The results are not discussed.