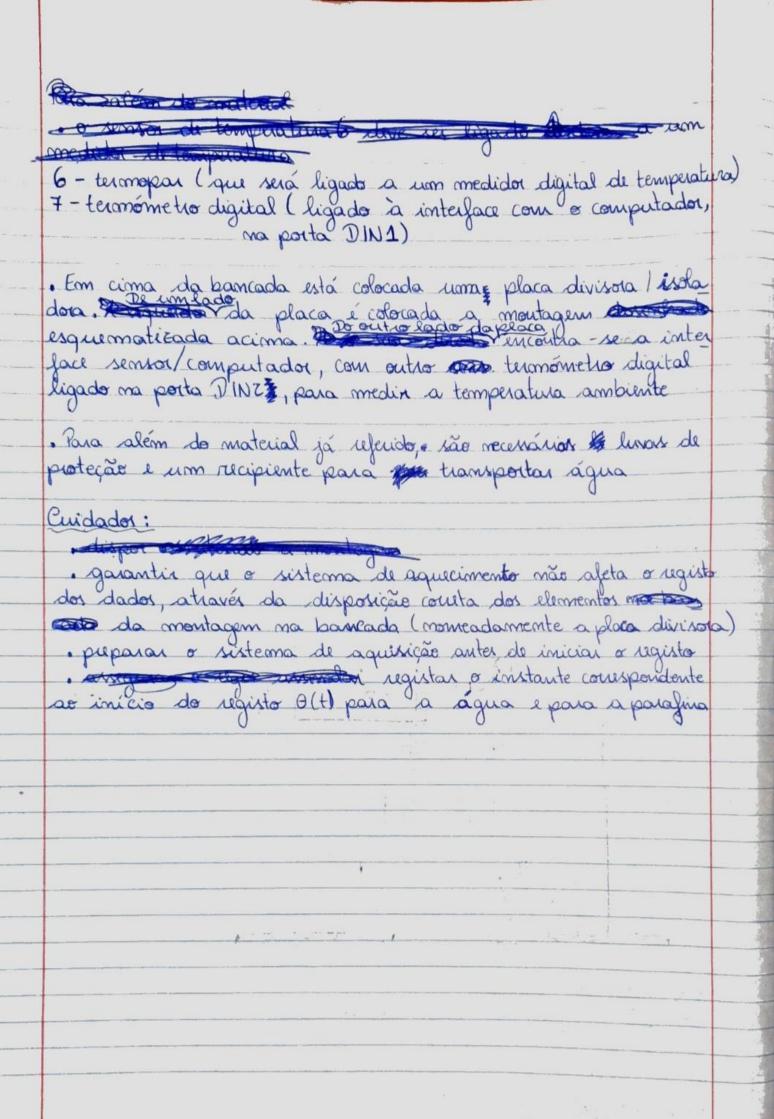
ab 1.19 Trabalho 1B - Verificação experimental da lei de Newton do arreferimento e es tudo da solidificação da parafima 16/5/2022 Salomé Coimbras Comes, Crupo 6, Plb Objetivos · Verificação experimental da la de Newton que rege a variação da tomperatura de um corpo em anefecimento ma atomosfera · Determinaçõe da temperatura da transiçõe de fase diquido solido da parafina · Parametização da expluiência · Introdução à aquisição automático de dados Moutagem experimental · É a mesma para as z experiências, que são realitadas em con junto

2-gobilé de vidro com água, com tapado com mica com 2 orifícios 4-tubo de ensaio com parafina 3-suportes 5-tubo de ensaio com água

Someous ou compressiones



thocedimento experimental Experiência 1) renficação experimental da lei de Newton 1) Proceder à montagem experimental discrita ainterior z) MAquecer, simultaneamente, a agua e a parafina, com aju da do disco de aquecimento Service of the servic 3) M Quando for atingida uma temperatura de 100°C, ramo a que o termónmetro que mede a temperatura ambiente fique à mesma distancia dos z (sproximadamente), mas suficiente mente afastado para que as suas medições mão sejam muito afetadas pelo calor irrodiado pelos tubos 4) D'Registar dados experimentais com o software "Logger Pro-· recificar que o cabo do termómetro da água está ligado as sensor de temperatura . abuix o licheito do logger pro "temperaturas" → "sampling".

escolher parâmetros: "data collection" → "mode" → "sampling".

as columns deven registar tempo e temperaturas (água e t. ambiente) da água (intervalor de tempo de 10x) até as jim da expe riência da parafina . stop " → "file > export data" > amotar o nome do ficheiro. abus ficheiro com Microsoft Word e formata-lo Especiência Z) - estudo do fenómeno fusão - solidificação → Como são feitas un simultâneo, os pontos 1), 2) e3) são coincidentes 4) 19 con um contrato Registar manualmente valores de temperatura e esser respetivo instante (O(t)); registar observações referantes 5) Magistar o instante indicado no computador apór retirar os n tubo de ensaio com parafina do gobelé

| 6) D'Registar dados de tempos e temperatura de 10 s em 10 s ou zon | |
|-----------------------------------------------------------------------------------------------------------------------------|-----|
| 6) D'Registar dados de tempor e temperatura de 10 s em 10 s ou zon em 20 s até ~45°C | 4 |
| Cuidados: | |
| . A pouta do sensor de temperatura deve encontrar-se mo centre | |
| da amostra, em cada tubo di ensaio 2 16/08 tob e Registor en auto | |
| Registo em aula | |
| Começamos por realizar a montagem esquematizada, todos | |
| amostrar dentro dos tubos de ensaio | |
| A parafina começou a fundir, ficando transparente. Fundiu de fora para dentro | |
| Certificamo-mos de que os sensores del temperatura mais se encon travam encostados as parredes dos tubos de ensaio | |
| Quando utirámos o tubo de ensaio com para de ensaio com para de gobelé, no LoggeiPro, registava 2000. | |
| Por volta de t = 360 s (medido no cronómetro) a parafina emisçou a solidificar por por jora (solidificar em direção ao cent | no) |
| Fernal - 5140 & mountage was the sivile estate | |
| Em Estado sólido. | 1 |
| Os valores de 8 (+) forans registados, durante cerca de 35 min, num documento Excel | |
| 1) 16/05 gry PC | |
| 0.17 | |
| | |
| | |
| | 1 |

Analus de dados

Experiência II

Na tabela I ..., encontram - M os dados recollidos com o software "Loggerho", bem como os valous de θ - θ a orano, em °C. Os valores de la $(\theta - \theta a)$ foram calculados apenas para a lar de anefecimiento (a partir dos 1540,00 %, aproximadamento).

Calculou-se também u ($\ln(\theta - \theta a)$), pelo metodo de propagação de incertetas: $u (\ln(\theta - \theta a)) = \frac{2 \ln(\theta - \theta a)}{2 \theta} u(\theta)^2 + \frac{2 \ln(\theta - \theta a)}{2 \theta} u(\theta a)^2$ De motar que, como θa variou ao longo da esperiência, o valor urado (θa i correspondente à media de todos os valores, que é de: $\theta a = (24,048 \pm 20,255)$ °C.

A incerte a de $(\theta - \theta a)$ i portanto; $u (\theta - \theta a) = \sqrt{\mu(\theta)} + \mu(\theta a)^2 = 0,255$ °C

| t/min | t/s | θ /ºC ± 1E-9ºC | θ _a /ºC | θ - θ _a / $^{\circ}$ C \pm 0.255 $^{\circ}$ C |
|-------|--------|----------------|--------------------|--------------------------------------------------------------------------|
| 0.000 | 0.00 | 26.416608810 | 23.645 | 2.771 |
| 0.167 | 10.00 | 28.166837692 | 23.718 | 4.448 |
| 0.333 | 20.00 | 29.114879608 | 23.718 | 5.397 |
| 0.500 | 30.00 | 29.989994049 | 23.718 | 6.272 |
| 0.667 | 40.00 | 30.719257355 | 23.645 | 7.074 |
| 0.833 | 50.00 | 31.740224838 | 23.645 | 8.095 |
| 1.000 | 60.00 | 31.521446228 | 23.718 | 7.803 |
| 1.167 | 70.00 | 31.813150406 | 23.791 | 8.022 |
| 1.333 | 80.00 | 32.469486237 | 23.645 | 8.824 |
| 1.500 | 90.00 | 32.688266754 | 23.645 | 9.043 |
| 1.667 | 100.00 | 31.740224838 | 24.958 | 6.782 |
| 1.833 | 110.00 | 33.344600677 | 23.645 | 9.699 |
| 2.000 | 120.00 | 32.542411804 | 23.791 | 8.751 |
| 2.167 | 130.00 | 33.855087280 | 23.791 | 10.064 |
| 2.333 | 140.00 | 34.000938416 | 23.791 | 10.210 |
| 2.500 | 150.00 | 34.657276154 | 23.718 | 10.939 |
| 2.667 | 160.00 | 34.584346771 | 24.010 | 10.574 |
| 2.833 | 170.00 | 34.584346771 | 23.791 | 10.793 |
| 3.000 | 180.00 | 34.948978424 | 23.791 | 11.158 |
| 3.167 | 190.00 | 35.386535645 | 23.937 | 11.449 |
| 3.333 | 200.00 | 35.678241730 | 23.791 | 11.887 |
| 3.500 | 210.00 | 36.042873383 | 23.791 | 12.252 |
| 3.667 | 220.00 | 36.261650085 | 23.791 | 12.470 |
| 3.833 | 230.00 | 36.845062256 | 23.864 | 12.981 |
| 4.000 | 240.00 | 37.501396179 | 23.864 | 13.637 |
| 4.167 | 250.00 | 37.647251129 | 23.791 | 13.856 |
| 4.333 | 260.00 | 38.084808350 | 23.645 | 14.439 |
| 4.500 | 270.00 | 38.741146088 | 23.791 | 14.950 |
| 4.667 | 280.00 | 39.251628876 | 23.791 | 15.460 |
| 4.833 | 290.00 | 39.616260529 | 23.937 | 15.679 |
| 5.000 | 300.00 | 40.053817749 | 24.521 | 15.533 |
| 5.167 | 310.00 | 40.272594452 | 23.937 | 16.335 |
| 5.333 | 320.00 | 41.074783325 | 23.937 | 17.138 |
| 5.500 | 330.00 | 42.095752716 | 23.500 | 18.596 |
| 5.667 | 340.00 | 42.168678284 | 23.937 | 18.232 |
| 5.833 | 350.00 | 42.679161072 | 23.937 | 18.742 |
| 6.000 | 360.00 | 43.335498810 | 24.010 | 19.325 |
| 6.167 | 370.00 | 43.554275513 | 23.864 | 19.690 |
| 6.333 | 380.00 | 44.648170471 | 23.937 | 20.711 |

| 0.500 | 390.00 | 45.377433777 | 24.010 | 21.307 |
|--------|--------|--------------|--------|--------|
| 6.667 | 400.00 | 45.742065430 | 24.010 | 21.732 |
| 6.833 | 410.00 | 46.398399353 | 23.937 | 22.461 |
| 7.000 | 420.00 | 47.929851532 | 24.229 | 23.701 |
| 7.167 | 430.00 | 47.565219879 | 23.937 | 23.628 |
| 7.333 | 440.00 | 48.294483185 | 24.010 | 24.284 |
| 7.500 | 450.00 | 49.023746490 | 24.010 | 25.014 |
| 7.667 | 460.00 | 49.753005981 | 24.302 | 25.451 |
| 7.833 | 470.00 | 50.992752075 | 24.739 | 26.253 |
| 8.000 | 480.00 | 51.357383728 | 24.885 | 26.472 |
| 8.167 | 490.00 | 52.378353119 | 23.718 | 28.660 |
| 8.333 | 500.00 | 52.815910339 | 24.448 | 28.368 |
| 8.500 | 510.00 | 54.347362518 | 24.010 | 30.337 |
| 8.667 | 520.00 | 54.274433136 | 24.010 | 30.264 |
| 8.833 | 530.00 | 54.930770874 | 23.937 | 30.994 |
| 9.000 | 540.00 | 55.587108612 | 24.010 | 31.577 |
| 9.167 | 550.00 | 56.170516968 | 23.937 | 32.233 |
| 9.333 | 560.00 | 57.191486359 | 24.375 | 32.817 |
| 9.500 | 570.00 | 57.993675232 | 24.083 | 33.911 |
| 9.667 | 580.00 | 58.795864105 | 24.083 | 34.713 |
| 9.833 | 590.00 | 59.816829681 | 23.864 | 35.953 |
| 10.000 | 600.00 | 60.910724640 | 24.229 | 36.682 |
| 10.167 | 610.00 | 60.910724640 | 24.010 | 36.901 |
| 10.333 | 620.00 | 61.858764648 | 24.010 | 37.849 |
| 10.500 | 630.00 | 62.588027954 | 23.791 | 38.797 |
| 10.667 | 640.00 | 63.244361877 | 24.083 | 39.161 |
| 10.833 | 650.00 | 63.681919098 | 24.083 | 39.599 |
| 11.000 | 660.00 | 64.338256836 | 24.083 | 40.255 |
| 11.167 | 670.00 | 65.359222412 | 24.010 | 41.349 |
| 11.333 | 680.00 | 66.088485718 | 24.010 | 42.078 |
| 11.500 | 690.00 | 66.963600159 | 23.937 | 43.026 |
| 11.667 | 700.00 | 67.692863464 | 24.083 | 43.610 |
| 11.833 | 710.00 | 68.495056152 | 23.281 | 45.214 |
| 12.000 | 720.00 | 68.713829041 | 24.083 | 44.631 |
| 12.167 | 730.00 | 69.880653381 | 24.010 | 45.871 |
| 12.333 | 740.00 | 70.755767822 | 24.083 | 46.673 |
| 12.500 | 750.00 | 71.339179993 | 24.156 | 47.183 |
| 12.667 | 760.00 | 72.141365051 | 24.083 | 48.058 |
| 12.833 | 770.00 | 73.016479492 | 23.937 | 49.079 |
| 13.000 | 780.00 | 74.183303833 | 24.375 | 49.809 |
| 13.167 | 790.00 | 74.329154968 | 24.083 | 50.246 |
| 13.333 | 800.00 | 75.423049927 | 24.302 | 51.121 |
| 13.500 | 810.00 | 76.079383850 | 24.156 | 51.923 |
| | | | | |

6.500 390.00 45.377433777 24.010

| • | | | | |
|--------|---------|---------------|--------|--------|
| 13.667 | 820.00 | 76.881568909 | 24.083 | 52.799 |
| 13.833 | 830.00 | 77.683761597 | 24.156 | 53.528 |
| 14.000 | 840.00 | 78.413024902 | 24.156 | 54.257 |
| 14.167 | 850.00 | 79.506919861 | 24.229 | 55.278 |
| 14.333 | 860.00 | 79.652770996 | 24.083 | 55.570 |
| 14.500 | 870.00 | 79.579841614 | 24.010 | 55.570 |
| 14.667 | 880.00 | 81.111297607 | 24.229 | 56.882 |
| 14.833 | 890.00 | 81.840553284 | 24.156 | 57.685 |
| 15.000 | 900.00 | 82.423965454 | 24.156 | 58.268 |
| 15.167 | 910.00 | 82.861526489 | 24.083 | 58.779 |
| 15.333 | 920.00 | 83.590789795 | 24.083 | 59.508 |
| 15.500 | 930.00 | 84.465904236 | 24.156 | 60.310 |
| 15.667 | 940.00 | 84.903457642 | 24.156 | 60.748 |
| 15.833 | 950.00 | 85.851501465 | 24.229 | 61.623 |
| 16.000 | 960.00 | 86.216133118 | 24.229 | 61.987 |
| 16.167 | 970.00 | 86.726615906 | 24.156 | 62.571 |
| 16.333 | 980.00 | 87.382949829 | 24.156 | 63.227 |
| 16.500 | 990.00 | 88.476844788 | 24.156 | 64.321 |
| 16.667 | 1000.00 | 88.841476440 | 23.281 | 65.561 |
| 16.833 | 1010.00 | 89.935371399 | 24.156 | 65.779 |
| 17.000 | 1020.00 | 90.737556458 | 24.229 | 66.509 |
| 17.167 | 1030.00 | 91.904380798 | 23.572 | 68.332 |
| 17.333 | 1040.00 | 91.904380798 | 24.010 | 67.894 |
| 17.500 | 1050.00 | 92.560714722 | 24.302 | 68.259 |
| 17.667 | 1060.00 | 93.362907410 | 24.083 | 69.280 |
| 17.833 | 1070.00 | 94.092163086 | 24.229 | 69.863 |
| 18.000 | 1080.00 | 94.894355774 | 24.156 | 70.738 |
| 18.167 | 1090.00 | 95.550689697 | 24.010 | 71.541 |
| 18.333 | 1100.00 | 96.717514038 | 24.229 | 72.489 |
| 18.500 | 1110.00 | 97.738479614 | 24.083 | 73.656 |
| 18.667 | 1120.00 | 98.176033020 | 24.010 | 74.166 |
| 18.833 | 1130.00 | 97.592628479 | 23.791 | 73.801 |
| 19.000 | 1140.00 | 99.342857361 | 24.156 | 75.187 |
| 19.167 | 1150.00 | 99.342857361 | 24.156 | 75.187 |
| 19.333 | 1160.00 | 99.634559631 | 24.083 | 75.552 |
| 19.500 | 1170.00 | 99.999191284 | 24.156 | 75.843 |
| 19.667 | 1180.00 | 100.436752319 | 24.156 | 76.281 |
| 19.833 | 1190.00 | 100.072120667 | 23.791 | 76.281 |
| 20.000 | 1200.00 | 100.436752319 | 24.156 | 76.281 |
| 20.167 | 1210.00 | 100.217971802 | 23.864 | 76.354 |
| 20.333 | 1220.00 | 100.436752319 | 24.156 | 76.281 |
| | | | | |

| 20.003 12.000 94.0677734 24.156 73.278 4.300 1.35633-2.01 1.2100 12.000 97.4667734 24.156 73.291 4.276 1.36463-2.01 1.2100 12.000 95.09504083 24.0818 71.157 4.265 1.40097-2.01 1.2100 12.000 95.09504083 24.0818 71.161 4.265 1.40097-2.01 1.2100 12.000 95.09504083 24.0818 71.161 4.265 1.40097-2.01 1.2100 1.2100 95.09504083 24.0818 71.161 4.265 1.40097-2.01 1.2100 1.2100 95.09504073 24.0818 70.47 4.255 1.40516-1.01 1.2100 1.2100 95.09504073 24.0818 70.47 4.255 1.40516-1.01 1.2100 1.2100 95.09504073 24.259 68.299 4.223 1.465113-2.01 1.2100 1.2100 97.08505053 24.156 66.6373 4.203 1.45516-2.22 22.000 12.000 97.08505053 24.156 66.6373 4.203 1.45936-2.22 22.000 12.000 97.08505053 24.256 66.6373 4.203 1.45936-2.22 22.000 12.000 97.08505053 24.256 66.6373 4.203 1.45936-2.22 22.000 12.000 97.08505053 24.256 66.6373 4.203 1.45936-2.22 22.000 12.000 97.08505053 24.259 66.467 4.166 1.55106-2.22 23.331 14.000 88.05605335 24.229 66.467 4.166 1.55106-2.23 23.000 13.000 88.05605335 24.229 66.467 4.166 1.55006-2.23 23.000 13.000 88.05605335 24.229 66.467 4.166 1.56001-2.23 23.000 23.000 88.00 88.13123131 24.000 67.0000471 22.997 69.299 4.000 4.000 67.0000471 22.997 69.299 4.000 4.000 67.0000471 22.997 69.299 4.000 4.000 67.0000471 22.997 69.299 4.000 4.000 67.0000471 22.997 69.299 4.000 4.000 67.0000471 22.997 69.299 4.000 4.000 67.0000471 22.997 69.299 4.000 4.000 67.0000471 22.997 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 | | | | | | | |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------|---------|---------------|--------|--------|-----------------------|----------------------------|
| 20.003 12.000 94.0677734 24.156 73.278 4.300 1.35633-2.01 1.2100 12.000 97.4667734 24.156 73.291 4.276 1.36463-2.01 1.2100 12.000 95.09504083 24.0818 71.157 4.265 1.40097-2.01 1.2100 12.000 95.09504083 24.0818 71.161 4.265 1.40097-2.01 1.2100 12.000 95.09504083 24.0818 71.161 4.265 1.40097-2.01 1.2100 1.2100 95.09504083 24.0818 71.161 4.265 1.40097-2.01 1.2100 1.2100 95.09504073 24.0818 70.47 4.255 1.40516-1.01 1.2100 1.2100 95.09504073 24.0818 70.47 4.255 1.40516-1.01 1.2100 1.2100 95.09504073 24.259 68.299 4.223 1.465113-2.01 1.2100 1.2100 97.08505053 24.156 66.6373 4.203 1.45516-2.22 22.000 12.000 97.08505053 24.156 66.6373 4.203 1.45936-2.22 22.000 12.000 97.08505053 24.256 66.6373 4.203 1.45936-2.22 22.000 12.000 97.08505053 24.256 66.6373 4.203 1.45936-2.22 22.000 12.000 97.08505053 24.256 66.6373 4.203 1.45936-2.22 22.000 12.000 97.08505053 24.259 66.467 4.166 1.55106-2.22 23.331 14.000 88.05605335 24.229 66.467 4.166 1.55106-2.23 23.000 13.000 88.05605335 24.229 66.467 4.166 1.55006-2.23 23.000 13.000 88.05605335 24.229 66.467 4.166 1.56001-2.23 23.000 23.000 88.00 88.13123131 24.000 67.0000471 22.997 69.299 4.000 4.000 67.0000471 22.997 69.299 4.000 4.000 67.0000471 22.997 69.299 4.000 4.000 67.0000471 22.997 69.299 4.000 4.000 67.0000471 22.997 69.299 4.000 4.000 67.0000471 22.997 69.299 4.000 4.000 67.0000471 22.997 69.299 4.000 4.000 67.0000471 22.997 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 69.995 | 20.500 | 1230.00 | 100.072120667 | 24.156 | 75.916 | In(θ-θ _a) | $u(ln(\theta-\theta_a))$ |
| 2.1000 126.000 97.446777344 24.156 73.291 4.294 1.36481-22 1.2016 127.000 95.95181120 24.998 71.614 4.271 1.39688-23 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 1.2016 | | | | | | | 1.33002E-20 |
| 12160 | | | - | | | | 1.35633E-20 1.36443E-20 |
| 11.00 | | | 95.915321350 | | | | 1.40209E-20 |
| 12.667 130,000 93.80901701 24.375 68.988 4.294 14.0552-2 22.000 132.000 93.80901701 24.375 68.988 4.294 4.291 1.46916-2 22.167 130.000 92.4877853963 24.156 67.003 4.214 1.47936-2 22.267 130.000 91.03726637 24.156 66.873 4.204 4.204 1.47936-2 22.267 130.000 91.03726637 24.156 66.873 4.194 4.031 1.47936-2 22.267 130.000 91.03726637 24.156 66.9873 4.194 1.51916-2 22.833 1370.000 88.938537391 24.088 65.852 4.197 1.51916-2 23.307 130.000 88.938537391 24.088 65.852 4.197 1.51916-2 23.307 130.000 88.698525305 24.229 64.467 4.174 1.5396-2 23.307 130.000 88.698525305 24.229 64.467 4.166 1.51916-2 23.333 140.000 88.75880955 24.259 64.467 4.166 1.51916-2 23.333 140.000 87.5288095 24.156 63.833 4.157 1.56038-2 23.2833 140.000 87.5288095 24.156 63.833 4.157 1.56038-2 24.000 64.102 4.160 1.560012-2 23.2833 140.000 88.75860955 24.156 61.696 4.122 1.60386-2 24.156 61.000 24.758655 24.259 60.529 4.103 1.652112-2 24.167 1450.000 87.5288095 24.156 61.006 4.122 1.60386-2 24.156 61.112 4.160 61.0382 24.250 61.000 87.588095 24.156 61.112 4.100 67.03800 87.58859107 23.937 88.851 4.097 1.67383-2 24.000 4.000 87.58859107 23.937 88.851 4.097 1.67383-2 25.000 130.000 82.27851131 24.083 88.500 4.075 67.9382-2 24.156 59.5851 4.097 67.0382-2 24.156 59.5851 4.097 67.0382-2 24.156 59.5851 4.097 67.0382-2 24.038 67.0382-2 24.038 67.0382-2 24.038 67.0382-2 24.038 67.0382-2 24.038 67.0382-2 24.038 67.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24.0382-2 24 | | | | | | | 1.39638E-20 |
| 1.456182 | | | | | | | 1.41951E-20 |
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| 23.500 1410.00 87.578800964 24.156 63.873 4.149 1.5773672. 23.833 1430.00 86.289054871 23.937 62.352 4.133 1.6038-2. 23.833 1430.00 86.289054871 23.937 62.352 4.133 1.6038-2. 24.000 1400 85.85150465 24.156 61.516 4122 1.62086-2. 24.167 1450.00 85.268089294 24.156 61.5112 41.31 1.6038-2. 24.333 1460.00 84.757506505 24.229 60.529 4.103 1.65211-2. 24.333 1460.00 84.757506505 24.229 60.529 4.103 1.65211-2. 24.600 1470.00 84.1017288 24.156 59.945 4.093 1.66819-2. 24.607 1480.00 83.73664930 24.156 59.945 4.093 1.66819-2. 24.607 1480.00 83.73664930 24.156 59.945 4.093 1.66819-2. 25.000 1500.00 82.642748972 24.083 85.850 4.070 1.707566-2. 25.167 1510.00 82.278154131 24.083 85.850 4.070 1.707566-2. 25.500 1500.00 80.857885439 24.156 59.955 4.021 1.74016-2. 25.500 1500.00 80.857885439 24.129 56.299 4.031 1.76738-2. 25.600 1500.00 80.872885439 24.129 56.299 4.031 1.76738-2. 25.600 1500.00 80.857885439 24.129 56.299 4.031 1.76738-2. 26.600 1500.00 79.798622131 24.083 55.716 4.001 1.77638-2. 26.600 1500.00 79.78662131 24.083 55.716 4.001 1.77638-2. 26.600 1500.00 79.78662131 24.083 55.716 4.002 1.79488-2. 26.600 1500.00 79.78662131 24.083 55.716 4.002 1.79488-2. 26.601 1000.00 77.3789107379 24.156 59.955 4.002 1.79488-2. 26.601 1000.00 77.389117370 24.156 59.955 4.002 1.79488-2. 26.601 1000.00 77.389117372 24.156 59.955 4.003 1.76238-2. 27.601 1600.00 77.389117372 24.156 59.56.99 4.033 1.76238-2. 27.601 1600.00 77.389117372 24.156 59.56.99 4.033 1.76238-2. 27.601 1600.00 77.389117372 24.156 59.56.99 4.033 1.76238-2. 27.601 1600.00 77.389117372 24.156 59.56.99 4.033 1.76238-2. 27.601 1600.00 77.389117372 24.156 59.56.99 4.033 1.76038-2. 27.601 1600.00 77.389117372 24.156 59.56.99 4.033 1.883112-2. 27.601 1600.00 77.389117372 24.156 59.56.99 4.033 1.890112-2. 27.601 1600.00 77.38911739 24.156 59.59 59.99 4.033 1.890112-2. 27.601 1600.00 77.38911739 24.156 59.59 59.99 4.033 1.890112-2. 27.601 1600.00 77.38911739 24.156 59.59 59.99 4.033 1.890112-2. 27.601 1600.00 77.38911739 24.156 59.59 59.99 4.033 1.890112-2. 27.601 1600.00 | | | | | | | 1.55119E-20 |
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| 24.833 1490.00 87.288597107 23.937 58.851 4.075 1.0991072 25.000 1500 87.647245972 24.083 58.550 4.076 1.718365-24 25.333 1520.00 81.621780996 24.156 5.9555 4.064 1.718365-24 25.550 1530.00 81.11979607 24.156 5.9555 4.064 1.718365-24 25.550 1530.00 80.11979607 24.156 5.9555 4.062 1.776535-25 25.667 1540.00 80.577885437 24.279 56.299 4.031 1.776235-2- 25.833 1550.00 80.162353784 23.427 56.737 4.038 1.776235-2- 26.000 1560.00 79.798622131 24.083 55.716 4.020 1.794881-2- 26.167 1570.00 79.09583826 24.229 54.841 4.004 1.823475-2- 26.567 1560.00 78.26737767 24.229 54.038 3.999 1.833225-2- 26.667 1560.00 77.73278089 23.135 54.038 3.999 1.833225-2- 26.667 1560.00 77.7327809 23.135 54.038 3.999 1.850545-2- 26.633 1610.00 77.7327809 23.135 54.038 3.999 1.850545-2- 27.107 1630.00 77.537910461 24.156 53.382 3.977 1.873295-2- 27.107 1630.00 76.360847156 24.156 53.382 3.977 1.873295-2- 27.667 1660.00 77.537950603 24.156 53.382 3.957 1.873295-2- 27.667 1660.00 76.38205603 24.156 51.996 3.993 1.993311-2- 27.833 1660.00 76.152305603 24.156 51.996 3.993 1.993311-2- 27.833 1600.00 76.38205603 24.156 51.996 3.993 1.993311-2- 28.800 18.00 74.75060104 24.038 50.392 3.991 3.991 1.993215-2- 27.833 1600.00 76.38205603 24.156 51.996 3.991 3.991 1.993215-2- 27.833 1600.00 76.38205603 24.156 51.996 3.991 3.991 3.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2.991 2 | | | | | | | 1.66819E-20 |
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| 25.500 159.000 81.621780396 24.156 57.466 4.051 1.740165-22 25.607 159.000 80.527885437 24.229 56.299 4.031 1.7767628-24 25.607 159.000 80.527885437 24.229 56.299 4.031 1.776728-24 25.607 159.000 80.163253784 23.427 56.737 4.038 1.776238-24 26.000 159.000 79.78622131 24.083 55.716 4.020 1.75938-24 26.167 1570.00 79.669358326 24.229 54.841 4.004 1.823476-24 26.633 158.000 78.70427173 24.156 54.549 3.999 1.833222-24 26.533 159.000 78.267173767 24.229 54.038 3.990 1.83322-24 26.5667 1500.00 77.8267173767 24.229 54.038 3.990 1.850542-24 26.6667 1500.00 77.82671736 24.229 54.038 3.990 1.850542-24 27.000 1620.00 77.537910461 24.156 53.674 39.83 1.850142-24 27.001 1620.00 77.537910461 24.156 53.682 3.977 1.87392-24 27.757 1630.00 76.808647256 24.156 53.683 3.994 1.859242-24 27.757 1650.00 76.735717773 24.010 52.726 3.965 1.856612-24 27.750 1650.00 76.73571773 24.010 52.726 3.965 1.856612-24 27.833 1670.00 77.35954832 24.083 51.267 3.937 1.950572-24 27.833 1670.00 74.85848892 24.001 59.75 3.931 1.950572-24 27.833 1670.00 74.85848892 24.001 59.975 3.931 1.950572-24 28.000 1880.00 74.475006104 24.083 50.392 3.920 1.994485-24 28.667 1700.00 73.826962280 24.083 49.444 3.901 20.20932-24.2094 28.833 1700.00 73.818672180 24.156 49.663 3.905 2.013882-24 28.500 1710.00 73.526962280 24.083 49.444 3.901 20.20932-24.2094 28.833 1700.00 73.818672180 24.156 49.663 3.905 2.013882-24 28.500 1710.00 73.526962280 24.083 49.444 3.901 20.20932-24 29.500 1740.00 77.352584324 24.083 49.544 3.901 20.20932-24 29.500 1740.00 77.95258433 24.033 48.569 3.838 20.08933-24 29.500 1740.00 77.95258433 24.033 48.569 3.838 20.08933-24 29.500 1770.00 77.192258433 24.033 48.569 3.838 30.20933-24 29.500 1770.00 77.192258433 24.033 49.544 3.847 3.940 3.868 20.09032-24 29.500 1770.00 77.193258433 24.033 49.544 3.857 3.800 2.09032-24 29.500 1770.00 77.19325843 44.034 48.569 3.839 2.20932-24 29.500 1770.00 07.45258533 44.034 49.444 3.930 3.000 3.000 3.000 3.000 3.000 3.000 3.000 3.000 3.000 3.000 3 | 25.000 | 1500.00 | 82.642745972 | 24.083 | 58.560 | 4.070 | 1.70766E-20 |
| 25.560 | | | | | | | 1.71836E-20 |
| 25.667 | | | | | | | 1.74016E-20 1.75576E-20 |
| 26.000 | 25.667 | 1540.00 | 80.527885437 | 24.229 | 56.299 | 4.031 | 1.77623E-20 |
| 26.167 | | | | | | | 1.76253E-20 |
| 26.533 1580.00 78.704727173 24.156 54.549 3.999 1.8332ZE-2 26.500 1590.00 78.267173767 24.229 54.038 3.990 1.85054E-2 27.6567 1500.00 77.829512732 24.156 53.674 3.983 1.85054E-2 27.000 1620.00 77.8397910461 24.156 53.674 3.983 77 1.8732762 27.167 1630.00 77.8397910461 24.156 53.673 3.993 77 1.873272 27.167 1630.00 76.808647156 24.156 52.653 3.994 1.89924E-2 27.500 1650.00 76.808647156 24.156 52.653 3.994 1.89924E-2 27.500 1650.00 76.152305603 24.156 51.996 3.951 1.92321E-2 27.500 1650.00 76.152305603 24.156 51.996 3.951 1.92321E-2 27.500 1650.00 76.152305603 24.156 51.996 3.951 1.92321E-2 27.833 1670.00 7.938648892 24.010 50.975 3.393 1.99078-2 28.000 1680.00 74.475006104 24.083 50.392 3.920 1.98444E-2 28.167 1690.00 73.818672180 24.156 49.663 3.905 2.01358E-2 28.500 1710.00 73.526962280 24.083 49.444 3.901 2.02249E-2 28.501 1710.00 73.526962280 24.083 49.444 3.901 2.02249E-2 28.833 1730.00 7.2651847839 24.083 48.569 3.883 20.58938-2 29.000 1740.00 77.5959841 24.156 49.663 3.890 2.01358E-2 29.000 1740.00 77.922584534 24.083 48.569 3.883 2.058938-2 29.167 1750.00 77.1922584534 24.083 47.840 3.868 2.09032E-2 29.500 1770.00 77.192584534 24.083 47.840 3.868 2.09032E-2 29.500 1770.00 77.192584534 24.083 46.162 3.832 2.12227E-2 29.500 1770.00 77.192584534 24.083 46.162 3.832 2.12227E-2 29.500 1770.00 77.192584534 24.083 46.162 3.832 2.12258E-2 29.500 1770.00 6.866552 2.937 46.595 3.849 2.12227E-2 29.501 1770.00 6.866552 2.937 46.595 3.849 2.12227E-2 29.502 1770.00 6.866552 2.937 46.595 3.849 2.12227E-2 29.503 180.00 6.866552 2.937 46.938 44.794 3.805 2.22655E-2 29.500 180.00 6.866552 2.9397 46.595 3.849 2.12227E-2 29.500 180.00 6.866552 2.9397 38.240 38.340 2.13258E-2 29.500 180.00 6.866552 2.9397 38.240 38.340 2.13258E-2 29.500 180.00 6.866552 2.9397 38.240 38.350 3.660 2.232455E-2 3.333 190.00 66.866552 2.9397 38.240 39.353 3.660 2.23245E | | | - | | | | 1.79483E-20 1.82347E-20 |
| 26.667 1600.00 77.829612782 24.156 53.674 3.983 1.86311E-20 26.833 1610.00 77.8737910461 24.156 53.382 3.977 1.87329E-20 27.167 1630.00 75.808647156 24.156 52.653 3.954 1.89924E-20 27.500 1650.00 75.8737910461 24.156 52.653 3.954 1.89924E-20 27.500 1650.00 76.152305603 24.156 52.653 3.954 1.89924E-20 27.500 1650.00 76.152305603 24.156 51.996 3.951 1.99321E-20 27.667 1660.00 75.350120544 24.083 51.267 3.937 1.95057E-20 27.667 1660.00 74.475006104 24.083 50.392 3.920 1.98444E-20 28.167 1690.00 73.818672180 24.156 49.653 3.931 1.991278-20 28.333 1700.00 73.818672180 24.156 49.663 3.995 2.01358E-20 28.500 1710.00 73.526962280 24.083 49.444 3.901 2.02289E-20 28.833 1700.00 73.526962280 24.083 49.444 3.901 2.02289E-20 29.000 174.00 77.55758818 24.156 49.653 3.883 2.05893E-20 29.000 174.00 77.55758818 24.156 48.350 3.883 2.05893E-20 29.000 174.00 77.55758818 23.718 47.840 3.868 2.09032E-20 29.500 770.00 71.932528528 24.083 47.840 3.868 2.09032E-20 29.500 770.00 71.932585281 23.718 47.840 3.868 2.09032E-20 29.500 770.00 71.93321228 24.229 46.665 3.849 21.13258E-20 29.601 770.00 71.93321228 24.229 46.665 3.849 21.13258E-20 29.601 770.00 71.93321228 24.229 46.665 3.849 21.13258E-20 29.607 770.00 71.93321228 24.000 24.66527 24.000 24.665252 24.000 24.665252 24.000 24.665252 24.000 24.665252 | 26.333 | 1580.00 | 78.704727173 | 24.156 | | | 1.83322E-20 |
| 26.833 | | | | | | | 1.85054E-20 |
| 27.000 1620.00 77.537910461 24.156 53.382 3.977 1.87329E-22 27.167 1630.00 76.808647156 24.156 52.653 3.964 1.89246E-23 27.500 1650.00 76.152305603 24.156 51.996 3.951 1.92321E-2 27.657 1660.00 75.80102544 24.083 51.267 3.937 1.9905721E-2 27.833 1670.00 74.955488892 24.010 50.975 3.931 1.96173E-2 28.000 1680.00 74.47500610 24.083 50.995 3.931 1.96173E-2 28.8167 1690.00 73.891599933 23.937 49.954 3.911 2.0018E-2 28.667 1700.00 73.818672180 24.156 49.663 3.905 2.01358E-2 28.500 1710.00 73.745742798 24.229 49.517 3.902 2.01358E-2 28.667 1720.00 73.745742798 24.229 49.517 3.902 2.01951E-2 28.633 1700.00 73.745742798 24.229 49.517 3.902 2.01951E-2 29.000 1740.00 72.505996704 24.156 48.350 3.878 2.00825E-2 29.000 1740.00 72.505996704 24.156 48.350 3.878 2.00825E-2 29.500 1770.00 71.922584534 24.083 47.840 3.868 2.09032E-2 29.500 1770.00 71.193321228 24.229 46.965 3.849 2.12227E-2 29.667 1780.00 70.901618958 24.010 46.892 3.848 2.12258E-2 29.667 1780.00 70.901618958 24.010 46.892 3.848 2.12257E-2 29.667 1780.00 70.245285034 24.083 44.923 3.805 2.12527E-2 30.000 1800.00 70.245285034 24.083 44.923 3.805 2.26657E-2 30.000 1800.00 69.05538940 24.083 44.923 3.805 2.2665E-2 30.000 1800.00 69.05538940 24.083 44.923 3.805 2.2665E-2 30.000 1800.00 60.667587264 24.156 43.506 3.818 2.19751E-2 3.1067 1810.00 60.66758243 24.083 44.923 3.805 2.2665E-2 30.000 1800.00 60.05538940 24.083 44.923 3.805 2.2665E-2 30.050 1830.00 69.05538940 24.083 44.923 3.805 2.2665E-2 30.050 1830.00 60.667584857 24.010 44.558 3.797 2.34427E-2 3.1333 1800.00 60.66757945 24.010 43.975 3.784 2.27404E-2 3.333 3.000 0.066 63.667597905 24.010 43.975 3.784 2.27404E-2 3.33 | | | | | | | 1.86311E-20 1.85054E-20 |
| 27.333 | 27.000 | 1620.00 | | 24.156 | 53.382 | 3.977 | 1.87329E-20 |
| 27.500 | | | | | | | 1.89924E-20 |
| 27.833 | | | | | | | 1.92321E-20 |
| 28.000 | 27.667 | 1660.00 | 75.350120544 | 24.083 | 51.267 | 3.937 | 1.95057E-20 |
| 28.167 1690.00 73.891593933 23.937 49.954 3.911 2.00182E-24 28.333 1700.00 73.8186721810 24.156 49.663 3.905 2.01358E-2 28.650 1710.00 73.7659662280 24.083 49.444 3.901 2.02249E-24 28.631 1730.00 73.651847839 24.083 48.569 3.883 2.05893E-21 28.833 1730.00 72.651847839 24.083 48.569 3.883 2.05893E-21 29.000 1740.00 72.505996704 24.156 48.350 3.878 2.06825E-21 29.167 1750.00 71.922584534 24.083 47.840 3.868 2.09032E-21 29.333 1760.00 71.557552881 23.718 47.840 3.868 2.09032E-21 29.500 1770.00 71.193321228 24.229 46.965 3.849 2.12927E-22 29.500 1770.00 71.93321228 24.229 46.965 3.849 2.12927E-22 29.667 1780.00 70.901618958 24.010 46.892 3.848 2.13258E-2 29.833 1790.00 70.464065552 23.937 46.527 3.840 2.14929E-23 30.000 1800.00 70.245285034 24.083 46.162 38.832 2.16627E-23 30.167 1810.00 70.026504517 24.083 45.944 3.827 2.17658E-23 30.333 1820.00 69.061872864 24.155 45.506 3.818 2.19751E-23 30.500 1830.00 69.005538940 24.083 44.923 3.805 2.22605E-23 30.667 1840.00 68.786758423 24.083 44.704 3.800 2.23695E-33 31.600 1860.00 67.984573364 24.010 43.975 3.784 2.27404E-21 31.167 1870.00 68.567977905 24.010 44.558 3.767 2.1329E-23 31.330 1880.00 68.26675843 24.010 43.975 3.784 2.27404E-21 31.167 1870.00 68.567977905 24.010 44.558 3.797 2.24427E-21 31.667 1900.00 66.24338653 24.083 44.704 3.800 2.23695E-3 31.500 1890.00 66.964865718 24.010 42.954 3.760 2.33281E-23 31.500 1890.00 66.964865718 24.010 42.954 3.760 2.33281E-23 31.500 1890.00 66.964865718 24.010 42.954 3.760 2.33281E-23 31.500 1890.00 66.74819641 23.718 43.026 3.762 2.32415E-23 31.500 1890.00 66.74819641 23.718 43.026 3.792 2.42427E-23 33.331 1900.00 66.867580749 24.010 42.954 3.760 2.33281E-23 33.331 1900.00 66.74819641 23.718 43.026 3.792 2.4247E-23 33.331 1900.00 66.74819641 23.718 43.026 3.793 3.704 2.4257E-23 33.331 1900.00 66.74819640 23.793 3.793 3.794 2.24427E-23 33.333 1900.00 66.74819640 23.793 3.793 3.666 2.232415E-23 33.333 1900.00 66.9655800 23.933 3.939 44.000 3.6673 2.44258E-23 33.333 1900.00 66.9655800 23.939 3.939 3.939 3.855 2.58985E-23 33.33 | | | | | | | 1.96173E-20 |
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| 31.500 1890.00 66.963600159 24.010 42.954 3.760 2.3281E-26 31.667 1900.00 66.744819641 23.718 43.026 3.762 2.32415E-26 31.833 1910.00 66.08485718 24.302 41.787 3.733 2.3931E-36 32.000 1920.00 66.234336853 24.083 42.151 3.741 2.3724E-26 32.333 1940.00 65.578002930 24.010 41.568 3.727 2.4057E-26 32.333 1940.00 64.629959106 25.396 39.234 3.670 2.54879E-26 32.500 1950.00 65.067520142 24.156 40.912 3.711 2.44429E-26 32.833 1970.00 64.389595106 24.010 40.620 3.704 2.46185E-26 32.833 1970.00 64.38956836 23.937 40.401 3.699 2.47518E-26 33.300 1980.00 64.046554565 24.083 39.964 3.688 2.50228E-26 33.167 1990.00 64.314276318 24.010 40.109 3.692 2.49318E-26 33.333 2000.00 63.463142395 24.010 39.453 3.675 2.53466E-26 33.3667 2020.00 63.317291260 24.010 39.307 3.671 2.54406E-26 33.3667 2020.00 63.098510742 24.010 39.308 3.666 2.5583E-26 33.3667 2020.00 63.098510742 24.010 39.088 3.666 2.5583E-26 34.032 2040.00 62.879734039 24.229 38.651 3.655 2.58726E-26 34.000 2040.00 61.858764648 24.448 37.411 3.622 2.673E-26 34.033 2060.00 62.0442173004 23.937 38.505 3.651 2.559706E-26 34.333 2060.00 62.04615784 24.010 37.995 3.657 2.53466E-26 34.333 2060.00 62.09615784 24.010 37.995 3.657 2.53466E-26 34.333 2060.00 62.09615784 24.010 37.995 3.657 2.559706E-26 34.333 2060.00 62.09615784 24.010 37.995 3.657 2.559706E-26 34.333 2060.00 62.09615784 24.010 37.557 3.626 2.66262E-26 35.500 210.00 60.9323532028 24.010 37.557 3.626 2.66262E-26 35.500 210.00 60.9323532028 24.010 37.557 3.626 2.66262E-26 35.500 210.00 60.932352028 24.010 37.557 3.626 2.66262E-26 35.500 210.00 60.932352028 24.010 36.974 3.610 2.70463E-26 35.500 210.00 60.932312469 23.937 36.536 3.598 2.73425E-26 35.500 210.00 60.932312469 23.937 36.536 3.598 2.73425E-26 35.500 210.00 60.932312469 23.500 36.828 3.606 2.71534E-26 35.500 210.00 60.93253208 24.010 36.974 3.606 2.71534E-26 35.500 210.00 60.93253208 24.010 36.974 3.606 2.71534E-26 35.500 210.00 60.93253208 24.010 36.974 3.506 2.70463E-26 35.500 210.00 60.932532269 23.3937 36.536 3.558 2.85637E-26 35.500 210.00 59.53342132 | | | | | | | 2.24427E-20 2.30462E-20 |
| 31.833 1910.00 66.08485718 24.302 41.787 3.733 2.3931E-26 32.000 1920.00 66.234336853 24.083 42.151 3.741 2.3724E-26 32.167 1930.00 65.5578002930 24.010 41.568 3.727 2.4057E-26 32.333 1940.00 64.629959106 25.396 39.234 3.670 2.54879E-26 32.500 1950.00 65.067520142 24.156 40.912 3.711 2.44429E-26 32.667 1960.00 64.629959106 24.010 40.620 3.704 2.46185E-26 32.833 1970.00 64.338256836 23.937 40.401 3.699 2.47518E-26 33.000 1980.00 64.046554565 24.083 39.964 3.688 2.50228E-3 33.000 1980.00 64.119476318 24.010 40.109 3.692 2.49318E-26 33.333 2000.00 63.463142395 24.010 39.453 3.675 2.53466E-26 33.3667 2020.00 63.398510742 24.010 39.307 3.671 2.54406E-26 33.667 2020.00 63.98510742 24.010 39.088 3.666 2.5583E-26 33.400 2040.00 61.858764648 24.448 37.411 3.622 2.673E-23 34.167 2050.00 62.442173004 23.937 38.505 3.651 2.59706E-26 34.333 2000.00 62.004615784 24.010 37.995 3.637 2.63195E-26 34.333 2090.00 60.400238037 23.937 36.643 3.596 2.7425E-26 35.000 2070.00 61.712913513 24.010 37.703 3.630 2.65232E-26 34.667 2080.00 61.6767058563 24.010 37.755 3.626 2.6626E-26 35.500 2100.00 60.983650208 24.010 37.755 3.626 2.6626E-26 35.500 2100.00 60.983650208 24.010 37.557 3.650 2.7425E-26 35.500 2100.00 60.983650208 24.010 37.557 3.650 2.7425E-26 35.500 2100.00 60.983650208 24.010 37.557 3.650 2.7425E-26 35.500 2100.00 60.983650208 24.010 37.555 2.55766E-26 35.500 2100.00 59.233421326 23.500 35.534 3.555 2.85677E-26 35.667 2140.00 59.889755249 32.281 | 31.500 | 1890.00 | 66.963600159 | 24.010 | 42.954 | 3.760 | 2.3281E-20 |
| 32.000 1920.00 66.234336853 24.083 42.151 3.741 2.3724E-20 32.167 1930.00 65.578002930 24.010 41.568 3.727 2.4057E-20 32.333 1940.00 64.629959106 25.396 39.234 3.670 2.5487E-20 32.500 1950.00 65.067520142 24.156 40.912 3.711 2.44429E-20 32.667 1960.00 64.629959106 24.010 40.620 3.704 2.46185E-20 32.833 1970.00 64.338256836 23.937 40.401 3.699 2.47518E-20 33.000 1980.00 64.046554565 24.083 39.964 3.688 2.50228E-20 33.167 1990.00 64.119476318 24.010 40.109 3.692 2.49318E-20 33.333 2000.00 63.463142395 24.010 39.453 3.675 2.53466E-23 33.500 2010.00 63.317291260 24.010 39.307 3.671 2.54406E-20 33.667 2020.00 63.098510742 24.010 39.088 3.666 2.5583E-20 33.833 2030.00 62.879734039 24.229 38.651 3.555 2.58726E-20 34.167 2050.00 62.442173004 23.937 38.505 3.651 2.59706E-20 34.333 2060.00 62.04615784 24.010 37.995 3.637 2.63195E-20 34.500 2070.00 61.712913513 24.010 37.703 3.630 2.65232E-2 34.667 2080.00 61.6712913513 24.010 37.703 3.630 2.65232E-2 34.667 2080.00 61.712913513 24.010 37.703 3.630 2.65232E-2 34.533 2090.00 60.400238037 23.937 36.543 3.596 2.7425E-2 35.500 2100.00 60.983650208 24.010 37.757 3.626 2.66262E-2 35.533 2120.00 60.400238037 23.937 36.536 3.598 2.73276-2 35.533 2120.00 60.983650208 24.010 37.757 3.626 2.66262E-2 35.533 2120.00 60.983650208 24.010 37.757 3.626 2.66262E-2 35.533 2120.00 60.983650208 24.010 37.757 3.626 2.66262E-2 35.533 2120.00 60.983650208 24.010 36.974 3.610 2.70463E-2 35.533 2120.00 60.983650208 24.010 36.974 3.610 2.77458E-2 35.530 2130.00 60.983650208 24.0 | | | - | | | | 2.32415E-20 |
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| 32.833 1970.00 64.338256836 23.937 40.401 3.699 2.47518E-20 33.000 1980.00 64.046554565 24.083 39.964 3.688 2.50228E-20 33.167 1990.00 64.119476318 24.010 40.109 3.692 2.43318-3 33.333 2000.00 63.463142395 24.010 39.453 3.675 2.53466E-20 33.500 2010.00 63.317291260 24.010 39.307 3.671 2.54406E-20 33.667 2020.00 63.098510742 24.010 39.088 3.666 2.5583E-20 33.833 2030.00 62.879734039 24.229 38.651 3.655 2.58726E-20 34.000 2040.00 61.858764648 37.411 3.622 2.673E-20 34.167 2050.00 62.442173004 23.937 38.505 3.651 2.59706E-20 34.333 2060.00 62.004615784 24.010 37.995 3.637 2.63195E-20 34.333 2060.00 62.004615784 24.010 37.995 3.637 2.63195E-20 34.500 2070.00 61.712913513 24.010 37.703 3.630 2.65232E-20 34.667 2080.00 61.567058563 24.010 37.557 3.626 2.66262E-23 34.833 2090.00 60.400238037 23.937 36.463 3.596 2.7425E-20 35.300 2100.00 60.983659208 24.010 36.974 3.610 2.70463E-20 35.5167 2110.00 60.473167419 23.937 36.536 3.598 2.7320E-20 35.533 2120.00 60.327312469 23.500 36.828 3.606 2.71534E-20 35.533 2120.00 60.181461334 23.354 36.828 3.606 2.71534E-20 35.833 2120.00 69.983755249 23.281 36.609 3.500 2.73157E-2 35.833 2120.00 59.233421326 23.500 35.734 3.556 2.79847E-20 36.667 2140.00 59.233421326 23.500 35.734 3.556 2.79847E-20 36.333 2180.00 59.233421326 23.500 35.734 3.556 2.79847E-20 36.367 2190.00 58.5964105 23.937 34.859 3.551 2.8687E-20 36.667 2200.00 58.59584105 23.937 34.859 3.551 2.8687E-20 36.667 2200.00 58.5958303070 23.937 34.567 3.539 2.90519E-20 | | | | | | | 2.44429E-20 2.46185E-20 |
| 33.167 1990.00 64.119476318 24.010 40.109 3.692 2.49318E-20 33.333 2000.00 63.463142395 24.010 39.453 3.675 2.53466E-20 33.500 2010.00 63.317291260 24.010 39.307 3.671 2.54406E-20 33.667 2020.00 63.098510742 24.010 39.088 3.666 2.55826E-23 33.833 2030.00 62.879734039 24.229 38.651 3.655 2.58726E-20 34.000 2040.00 61.858764648 24.448 37.411 3.622 2.673E-20 34.167 2050.00 62.04615784 24.010 37.995 3.651 2.59706E-20 34.500 2070.00 61.712913513 24.010 37.995 3.630 2.6523E-20 34.667 2080.00 61.567058563 24.010 37.557 3.626 2.66262E-2 34.833 2090.00 60.400238037 23.937 36.463 3.596 2.7425E-20 35.000 2100.00 | 32.833 | 1970.00 | 64.338256836 | 23.937 | 40.401 | 3.699 | 2.47518E-20 |
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| 33.833 2030.00 62.879734039 24.229 38.651 3.655 2.58726E-20 34.000 2040.00 61.858764648 24.448 37.411 3.622 2.673E-20 34.167 2050.00 62.442173004 23.937 38.505 3.651 2.59706E-20 34.333 2060.00 62.004615784 24.010 37.995 3.637 2.63195E-20 34.500 2070.00 61.712913513 24.010 37.703 3.630 2.65232E-20 34.833 2090.00 61.567058563 24.010 37.557 3.626 2.66262E-20 35.000 2100.00 60.983650208 24.010 36.974 3.610 2.70463E-20 35.167 2110.00 60.473167419 23.937 36.536 3.598 2.73702E-20 35.500 2130.00 60.327312469 23.500 36.828 3.606 2.71534E-20 35.667 2140.00 59.889755249 23.281 36.609 3.600 2.73157E-20 35.833 2150.00 | 33.500 | 2010.00 | | 24.010 | 39.307 | 3.671 | 2.54406E-20 |
| 34.000 2040.00 61.858764648 24.448 37.411 3.622 2.673E-20 34.167 2050.00 62.442173004 23.937 38.505 3.651 2.5970EE-20 34.333 2060.00 62.004615784 24.010 37.995 3.637 2.63195E-20 34.500 2070.00 61.712913513 24.010 37.703 3.630 2.65232E-20 34.667 2080.00 61.567058563 24.010 37.557 3.626 2.66262E-20 34.833 2090.00 60.400238037 23.937 36.463 3.596 2.7425E-20 35.000 2100.00 60.983650208 24.010 36.974 3.610 2.70463E-20 35.333 2120.00 60.473167419 23.937 36.536 3.598 2.73702E-20 35.500 2130.00 60.327312469 23.500 36.828 3.606 2.71534E-20 35.500 2130.00 60.181461334 23.354 36.828 3.606 2.71534E-20 35.833 2150.00 < | | | | | | | |
| 34.333 2060.00 62.004615784 24.010 37.995 3.637 2.63195E-20 34.500 2070.00 61.712913513 24.010 37.703 3.630 2.65232E-2 34.667 2080.00 61.567058563 24.010 37.557 3.626 2.6626E-2 34.833 2090.00 60.400238037 23.937 36.463 3.596 2.7425E-2 35.000 2100.00 60.983650208 24.010 36.974 3.610 2.70463E-2 35.167 2110.00 60.473167419 23.937 36.536 3.598 2.73702E-2 35.500 2130.00 60.181461334 23.550 36.828 3.606 2.71534E-2 35.667 2140.00 59.889755249 23.281 36.609 3.600 2.73157E-2 35.833 2150.00 59.525123596 24.448 35.078 3.558 2.85083E-2 36.000 2160.00 59.233421326 23.500 35.734 3.576 2.79847E-2 36.333 2180.00 58.79 | 34.000 | 2040.00 | 61.858764648 | 24.448 | | | 2.673E-20 |
| 34.500 2070.00 61.712913513 24.010 37.703 3.630 2.65232E-26 34.667 2080.00 61.567058563 24.010 37.557 3.626 2.66262E-26 34.833 2090.00 60.400238037 23.937 36.463 3.596 2.7425E-26 35.000 2100.00 60.983659208 24.010 36.974 3.610 2.70463E-26 35.167 2110.00 60.473167419 23.937 36.536 3.598 2.73702E-26 35.333 2120.00 60.327312469 23.500 36.828 3.606 2.71534E-26 35.500 2130.00 60.181461334 23.554 36.828 3.606 2.71534E-26 35.833 2150.00 59.889755249 23.281 36.609 3.600 2.73157E-26 35.833 2150.00 59.525123596 24.448 35.078 3.558 2.85083E-26 36.000 2160.00 59.23421326 23.500 35.734 3.576 2.79847E-26 36.333 2180.00 | | | | | | | 2.59706E-20 |
| 34.667 2080.00 61.567058563 24.010 37.557 3.626 2.66262E-26 34.833 2090.00 60.400238037 23.937 36.463 3.596 2.7425E-26 35.000 2100.00 60.983650208 24.010 36.974 3.610 2.70463E-26 35.167 2110.00 60.473167419 23.937 36.536 3.598 2.73702E-26 35.333 2120.00 60.327312469 23.500 36.828 3.606 2.71534E-26 35.500 2130.00 60.181461334 23.354 36.828 3.606 2.71534E-26 35.833 2150.00 59.889755249 23.281 36.609 3.600 2.73157E-26 35.833 2150.00 59.25123596 24.448 35.078 3.558 2.85083E-26 36.000 2160.00 59.233421326 23.500 35.734 3.576 2.79847E-26 36.36167 2170.00 59.014640808 24.010 35.005 3.555 2.85677E-2 36.500 2190.00 | | | | | | | 2.63195E-20 2.65232E-20 |
| 35.000 2100.00 60.983650208 24.010 36.974 3.610 2.70463E-26 35.167 2110.00 60.473167419 23.937 36.536 3.598 2.73702E-26 35.333 2120.00 60.327312469 23.500 36.828 3.606 2.71534E-26 35.500 2130.00 60.181461334 23.354 36.828 3.606 2.71534E-26 35.667 2140.00 59.889755249 23.281 36.609 3.600 2.73157E-26 35.833 2150.00 59.525123596 24.448 35.078 3.558 2.85083E-26 36.000 2160.00 59.23421326 23.500 35.734 3.576 2.79847E-26 36.167 2170.00 59.014640808 24.010 35.005 3.555 2.85677E-26 36.330 2180.00 58.795864105 23.937 34.859 3.551 2.86972E-26 36.667 2200.00 58.358303070 23.937 34.567 3.543 3.89293E-26 | 34.667 | 2080.00 | 61.567058563 | 24.010 | 37.557 | 3.626 | 2.66262E-20 |
| 35.167 2110.00 60.473167419 23.937 36.536 3.598 2.73702E-26 35.333 2120.00 60.327312469 23.500 36.828 3.606 2.71534E-26 35.500 2130.00 60.181461334 23.354 36.828 3.606 2.71534E-26 35.667 2140.00 59.889755249 23.281 36.609 3.600 2.73157E-26 35.833 2150.00 59.525123596 24.448 35.078 3.558 2.85083E-26 36.000 2160.00 59.233421326 23.500 35.734 3.576 2.79847E-26 36.167 2170.00 59.014640808 24.010 35.005 3.555 2.85677E-26 36.530 2190.00 58.795864105 23.937 34.859 3.551 2.86972E-26 36.667 2200.00 58.358303070 23.937 34.567 3.543 3.89293E-26 36.667 2200.00 58.358303070 23.937 34.421 3.539 2.90519E-26 | | | | | | | 2.7425E-20 |
| 35.333 2120.00 60.327312469 23.500 36.828 3.606 2.71534E-26 35.500 2130.00 60.181461334 23.354 36.828 3.606 2.71534E-26 35.667 2140.00 59.889755249 23.281 36.609 3.600 2.73157E-26 35.833 2150.00 59.525123596 24.448 35.078 3.558 2.85087E-26 36.000 2160.00 59.233421326 23.500 35.734 3.576 2.79847E-26 36.167 2170.00 59.014640808 24.010 35.005 3.555 2.85677E-26 36.333 2180.00 58.795864105 23.937 34.859 3.551 2.86872E-26 36.500 2190.00 58.504158020 23.937 34.567 3.543 2.89293E-26 36.667 2200.00 58.358303070 23.937 34.421 3.539 2.90519E-26 | | | | | | | 2.70463E-20 2.73702E-20 |
| 35.667 2140.00 59.889755249 23.281 36.609 3.600 2.73157E-26 35.833 2150.00 59.525123596 24.448 35.078 3.558 2.85083E-26 36.000 2160.00 59.233421326 23.500 35.734 3.576 2.79847E-26 36.167 2170.00 59.014640808 24.010 35.005 3.555 2.85677E-26 36.333 2180.00 58.795864105 23.937 34.859 3.551 2.86872E-26 36.500 2190.00 58.504158020 23.937 34.567 3.543 2.89293E-26 36.667 2200.00 58.358303070 23.937 34.421 3.539 2.90519E-26 | 35.333 | 2120.00 | 60.327312469 | 23.500 | 36.828 | 3.606 | 2.71534E-20 |
| 35.833 2150.00 59.525123596 24.448 35.078 3.558 2.85083E-26 36.000 2160.00 59.233421326 23.500 35.734 3.576 2.79847E-21 36.167 2170.00 59.014640808 24.010 35.005 3.555 2.85677E-21 36.333 2180.00 58.795864105 23.937 34.859 3.551 2.86872E-2 36.500 2190.00 58.504158020 23.937 34.567 3.543 2.89293E-2 36.667 2200.00 58.358303070 23.937 34.421 3.539 2.90519E-26 | | | | | | | 2.71534E-20 |
| 36.000 2160.00 59.233421326 23.500 35.734 3.576 2.79847E-20 36.167 2170.00 59.014640808 24.010 35.005 3.555 2.85677E-20 36.333 2180.00 58.795864105 23.937 34.859 3.551 2.86872E-20 36.500 2190.00 58.504158020 23.937 34.567 3.543 2.89293E-20 36.667 2200.00 58.358303070 23.937 34.421 3.539 2.90519E-20 | | | | | | | 2.73157E-20 2.85083E-20 |
| 36.333 2180.00 58.795864105 23.937 34.859 3.551 2.86872E-26 36.500 2190.00 58.504158020 23.937 34.567 3.543 2.89293E-26 36.667 2200.00 58.358303070 23.937 34.421 3.539 2.90519E-26 | 36.000 | 2160.00 | 59.233421326 | 23.500 | 35.734 | | 2.79847E-20 |
| 36.500 2190.00 58.504158020 23.937 34.567 3.543 2.89293E-26 36.667 2200.00 58.358303070 23.937 34.421 3.539 2.90519E-26 | | | | | | | 2.85677E-20 |
| 36.667 2200.00 58.358303070 23.937 34.421 3.539 2.90519E-20 | | | | | | | 2.86872E-20 2.89293E-20 |
| 26 022 2210 00 | 36.667 | 2200.00 | 58.358303070 | 23.937 | 34.421 | 3.539 | 2.90519E-20 |
| | 36.833 | 2210.00 | 57.993675232 | 24.083 | 33.911 | 3.524 | 2.94892E-20 2.88684E-20 |

- - Constitution of the contract of the contra

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| 37.167 | 2230.00 | 57.629043579 | 24.229 | 33.400 | 3.509 | 2.99399E-20 |
|------------------|--------------------|------------------------------|------------------|------------------|----------------|----------------------------|
| 37.333 | 2240.00 | 57.993675232 | 23.864 | 34.129 | 3.530 | 2.93002E-20 |
| 37.500 | 2250.00 | 58.212451935 | 23.645 | 34.567 | 3.543 | 2.89293E-20 |
| 37.667 | 2260.00 | 57.337337494 | 24.083 | 33.254 | 3.504 | 3.00712E-20 |
| 37.833 | 2270.00 | 57.629043579 | 23.937 | 33.692 | 3.517 | 2.96807E-20 |
| 38.000 | 2280.00 | 56.753929138 | 23.937 | 32.817 | 3.491 | 3.04722E-20 |
| 38.167 | 2290.00 | 56.462223053 | 23.937 | 32.525 | 3.482 | 3.07455E-20 |
| 38.333 | 2300.00 | 56.170516968 | 23.937 | 32.233 | 3.473 | 3.10237E-20 |
| 38.500 | 2310.00 | 56.024665833 | 24.302 | 31.723 | 3.457 | 3.15229E-20 |
| 38.667 38.833 | 2320.00 2330.00 | 55.514183044 55.149551392 | 23.864 23.791 | 31.650 31.358 | 3.455 3.445 | 3.15956E-20 3.18895E-20 |
| 39.000 | 2340.00 | 55.222476959 | 25.250 | 29.973 | 3.400 | 3.33637E-20 |
| 39.167 | 2350.00 | 54.857845306 | 24.958 | 29.900 | 3.398 | 3.34451E-20 |
| 39.333 | 2360.00 | 54.420288086 | 23.500 | 30.921 | 3.431 | 3.23408E-20 |
| 39.500 | 2370.00 | 54.566139221 | 24.156 | 30.410 | 3.415 | 3.28837E-20 |
| 39.667 | 2380.00 | 54.493213654 | 23.937 | 30.556 | 3.420 | 3.27267E-20 |
| 39.833 | 2390.00 | 54.347362518 | 23.791 | 30.556 | 3.420 | 3.27267E-20 |
| 40.000 | 2400.00 | 54.055656433 | 23.937 | 30.119 | 3.405 | 3.32021E-20 |
| 40.167 | 2410.00 | 54.128582001 | 24.229 | 29.900 | 3.398 | 3.34451E-20 |
| 40.333 40.500 | 2420.00 2430.00 | 54.201507568 53.545173645 | 24.229 23.937 | 29.973 29.608 | 3.400 3.388 | 3.33637E-20 3.37746E-20 |
| 40.667 | 2440.00 | 53.399318695 | 23.937 | 29.462 | 3.383 | 3.39418E-20 |
| 40.833 | 2450.00 | 53.836875916 | 23.281 | 30.556 | 3.420 | 3.27267E-20 |
| 41.000 | 2460.00 | 52.961761475 | 24.083 | 28.879 | 3.363 | 3.46275E-20 |
| 41.167 | 2470.00 | 52.815910339 | 23.937 | 28.879 | 3.363 | 3.46275E-20 |
| 41.333 | 2480.00 | 52.524204254 | 23.864 | 28.660 | 3.356 | 3.48918E-20 |
| 41.500 | 2490.00 | 52.232498169 | 24.010 | 28.222 | 3.340 | 3.54328E-20 |
| 41.667 | 2500.00 | 52.232498169 | 24.010 | 28.222 | 3.340 | 3.54328E-20 |
| 41.833 | 2510.00 | 51.794940948 | 24.010 | 27.785 | 3.324 | 3.59908E-20 |
| 42.000 42.167 | 2520.00 | 51.722015381 51.722015381 | 24.083 24.010 | 27.639 | 3.319 | 3.61807E-20 |
| 42.167 | 2530.00 2540.00 | 51.722015381 | 24.010 | 27.712 27.056 | 3.322 3.298 | 3.60855E-20 3.69609E-20 |
| 42.500 | 2550.00 | 51.211532593 | 24.010 | 27.201 | 3.303 | 3.67627E-20 |
| 42.667 | 2560.00 | 51.138607025 | 23.791 | 27.347 | 3.309 | 3.65666E-20 |
| 42.833 | 2570.00 | 50.992752075 | 23.645 | 27.347 | 3.309 | 3.65666E-20 |
| 43.000 | 2580.00 | 51.211532593 | 23.281 | 27.931 | 3.330 | 3.58028E-20 |
| 43.167 | 2590.00 | 50.555194855 | 23.864 | 26.691 | 3.284 | 3.74658E-20 |
| 43.333 | 2600.00 | 50.919826508 | 23.718 | 27.201 | 3.303 | 3.67627E-20 |
| 43.500 43.667 | 2610.00 | 50.336418152 49.898860931 | 23.864 | 26.472 | 3.276 | 3.77754E-20 |
| 43.833 | 2620.00 2630.00 | 49.898860931 | 23.937 | 25.962 25.962 | 3.257 3.257 | 3.85182E-20 3.85182E-20 |
| 44.000 | 2640.00 | 49.607154846 | 23.937 | 25.670 | 3.245 | 3.89559E-20 |
| 44.167 | 2650.00 | 49.388378143 | 23.572 | 25.816 | 3.251 | 3.87358E-20 |
| 44.333 | 2660.00 | 49.169597626 | 23.864 | 25.305 | 3.231 | 3.95172E-20 |
| 44.500 | 2670.00 | 49.096672058 | 24.010 | 25.087 | 3.222 | 3.98619E-20 |
| 44.667 | 2680.00 | 49.096672058 | 23.937 | 25.160 | 3.225 | 3.97463E-20 |
| 44.833 45.000 | 2690.00 2700.00 | 49.534229279 48.659114838 | 24.010 24.593 | 25.524 24.066 | 3.240 3.181 | 3.91785E-20 4.1553E-20 |
| 45.167 | 2710.00 | 48.367408752 | 23.937 | 24.430 | 3.196 | 4.09328E-20 |
| 45.333 | 2720.00 | 48.367408752 | 23.864 | 24.503 | 3.199 | 4.0811E-20 |
| 45.500 | 2730.00 | 48.221557617 | 23.937 | 24.284 | 3.190 | 4.11786E-20 |
| 45.667 | 2740.00 | 48.075702667 | 24.083 | 23.993 | 3.178 | 4.16793E-20 |
| 45.833 | 2750.00 | 47.784000397 | 23.937 | 23.847 | 3.172 | 4.19342E-20 |
| 46.000 46.167 | 2760.00 2770.00 | 47.711071014 47.784000397 | 23.937 23.937 | 23.774 23.847 | 3.169 3.172 | 4.20628E-20 4.19342E-20 |
| 46.333 | 2780.00 | 47.492294312 | 23.864 | 23.628 | 3.162 | 4.23225E-20 |
| 46.500 | 2790.00 | 47.346443176 | 23.864 | 23.482 | 3.156 | 4.25853E-20 |
| 46.667 | 2800.00 | 47.273513794 | 23.864 | 23.409 | 3.153 | 4.2718E-20 |
| 46.833 | 2810.00 | 47.127662659 | 24.302 | 22.826 | 3.128 | 4.38099E-20 |
| 47.000 | 2820.00 | 46.908882141 | 23.864 | 23.045 | 3.137 | 4.33939E-20 |
| 47.167 | 2830.00 | 46.690105438 | 23.864 | 22.826 | 3.128 | 4.38099E-20 |
| 47.333 | 2840.00 | 46.981811523 | 24.083 | 22.899 | 3.131 | 4.36703E-20 |
| 47.500 47.667 | 2850.00 2860.00 | 46.471324921 46.398399353 | 23.937 23.937 | 22.534 22.461 | 3.115 3.112 | 4.4377E-20 4.45211E-20 |
| 47.833 | 2870.00 | 46.252548218 | 23.645 | 22.607 | 3.118 | 4.42338E-20 |
| 48.000 | 2880.00 | 46.106697083 | 23.864 | 22.243 | 3.102 | 4.4959E-20 |
| 48.167 | 2890.00 | 46.033767700 | 23.937 | 22.097 | 3.095 | 4.52557E-20 |
| 48.333 | 2900.00 | 45.814990997 | 23.864 | 21.951 | 3.089 | 4.55564E-20 |
| 48.500 | 2910.00 | 45.596210480 | 23.937 | 21.659 | 3.075 | 4.617E-20 |
| 48.667 | 2920.00 | 45.596210480 | 23.718 | 21.878 | 3.085 | 4.57083E-20 |
| 48.833 | 2930.00 | 45.304508209 | 23.718 | 21.586 | 3.072 | 4.6326E-20 |
| 49.000 | 2940.00 | 45.231578827 | 23.864 | 21.367 | 3.062 | 4.68003E-20 |
| 49.167 49.333 | 2950.00 2960.00 | 44.866947174 44.939876556 | 23.937 23.937 | 20.930 21.003 | 3.041 3.045 | 4.77787E-20 4.76128E-20 |
| 49.500 | 2970.00 | 44.721096039 | 23.937 | 20.784 | 3.034 | 4.8114E-20 |
| 49.667 | 2980.00 | 44.721096039 | 23.937 | 20.784 | 3.034 | 4.8114E-20 |
| 49.833 | 2990.00 | 45.085727692 | 23.937 | 21.149 | 3.052 | 4.72844E-20 |
| 50.000 | 3000.00 | 44.356464386 | 23.937 | 20.419 | 3.016 | 4.89732E-20 |
| 50.167 | 3010.00 | 44.210613251 | 23.937 | 20.273 | 3.009 | 4.93255E-20 |
| 50.333 | 3020.00 | 44.356464386 | 23.937 | 20.419 | 3.016 | 4.89732E-20 |
| 50.500 | 3030.00 | 44.064762115 | 23.864 | 20.201 | 3.006 | 4.95035E-20 |
| 50.667 50.833 | 3040.00 3050.00 | 43.918907166 43.773056030 | 23.937 23.937 | 19.982 19.836 | 2.995 2.987 | 5.00456E-20 5.04135E-20 |
| 51.000 | 3060.00 | 43.481349945 | 24.010 | 19.836 | 2.969 | 5.13576E-20 |
| 51.167 | 3070.00 | 43.627201080 | 23.718 | 19.909 | 2.991 | 5.02289E-20 |
| 51.333 | 3080.00 | 43.408424377 | 23.864 | 19.544 | 2.973 | 5.1166E-20 |
| 51.500 | 3090.00 | 43.335498810 | 23.864 | 19.471 | 2.969 | 5.13576E-20 |
| 51.667 | 3100.00 | 43.189643860 | 23.937 | 19.253 | 2.958 | 5.19412E-20 |
| 51.833 52.000 | 3110.00 3120.00 | 43.043792725 42.970867157 | 23.864 23.937 | 19.180 19.034 | 2.954 2.946 | 5.21387E-20 5.25383E-20 |
| 52.000 | 3120.00 | 42.679161072 | 23.937 | 18.815 | 2.946 | 5.25383E-20 5.31492E-20 |
| 52.333 | 3140.00 | 42.606235504 | 23.645 | 18.961 | 2.942 | 5.27403E-20 |
| 52.500 | 3150.00 | 42.606235504 | 23.937 | 18.669 | 2.927 | 5.35644E-20 |
| 52.667 | 3160.00 | 43.262573242 | 23.354 | 19.909 | 2.991 | 5.02289E-20 |
| 52.833 | 3170.00 | 42.460384369 | 24.229 | 18.232 | 2.903 | 5.48499E-20 |
| 53.000 53.167 | 3180.00 3190.00 | 42.387454987 42.241603851 | 23.864 | 18.523 18.304 | 2.919 2.907 | 5.39862E-20 5.46314E-20 |
| 53.333 | 3200.00 | 41.804046631 | 23.864 | 17.940 | 2.887 | 5.57418E-20 |
| 53.500 | 3210.00 | 42.095752716 | 23.500 | 18.596 | 2.923 | 5.37744E-20 |
| 53.667 | 3220.00 | 41.876972198 | 24.010 | 17.867 | 2.883 | 5.59693E-20 |
| | | | | | | |
| | | | | | | |

| | | | | | | | 70.467 | 4200.00 | | 24.002 | 0.407 | 2.242 | 4.05000 |
|------------------------------------------------------------------------------|-----------------------------------------------------|----------------------------------------------|----------------------------|----------------------------------|-------------------------|-------------------------------------------|--------------------------------------|-------------------------------|--------------------------------------------------------------|----------------------------|----------------------------------|-------------------------|----------------------------------------------------|
| 53.833 | 3230.00 | 41.804046631 | 23.500 | 18.304 | 2.907 | 5.46314E-20 | 73.167 73.333 | 4390.00 4400.00 | | 24.083 24.229 | 9.407 9.262 | 2.242 2.226 | 1.06298 1.07972 |
| 54.000 | 3240.00 | 41.731121063 | 23.937 | 17.794 | 2.879 | 5.61987E-20 | 73.500 73.667 | 4410.00 4420.00 | | 24.375 24.083 | 9.043 9.626 | 2.202 2.264 | 1.10585 1.03882 |
| 54.167 54.333 | 3250.00 3260.00 | 41.585266113 41.439414978 | 23.864 | 17.721 17.575 | 2.875 2.866 | 5.643E-20 5.68983E-20 | 73.833 | 4430.00 | 33.271675110 | 24.083 | 9.189 | 2.218 | 1.08829 |
| 54.500 | 3270.00 | 41.439414978 | 24.010 | 17.284 | 2.850 | 5.78586E-20 | 74.000 74.167 | 4440.00 4450.00 | 32.979969025 33.271675110 | 23.864 24.083 | 9.116 9.189 | 2.210 2.218 | 1.097 1.08829 |
| 54.667 | 3280.00 | 41.293563843 | 23.864 | 17.429 | 2.858 | 5.73744E-20 | 74.333 | 4460.00 | 33.125823975 | 24.156 | 8.970 | 2.194 | 1.11484 |
| 54.833 55.000 | 3290.00 3300.00 | 40.710151672 41.074783325 | 24.083 | 16.627 17.211 | 2.811 2.846 | 6.01425E-20 5.81037E-20 | 74.500 74.667 | 4470.00 4480.00 | 33.563381195 | 24.083 24.156 | 9.480 8.824 | 2.249 2.177 | 1.05481 |
| 55.167 | 3310.00 | 40.928932190 | 24.375 | 16.554 | 2.840 | 6.04074E-20 | 74.833 | 4490.00 | | 24.156 | 8.970 | 2.177 | 1.13326 |
| 55.333 | 3320.00 | 40.928932190 | 23.718 | 17.211 | 2.846 | 5.81037E-20 | 75.000 | 4500.00 | 32.979969025 | 24.083 | 8.897 | 2.186 | 1.12397 |
| 55.500 | 3330.00 3340.00 | 40.856006622 | 23.937 | 16.919 | 2.828 | 5.91055E-20 | 75.167 75.333 | 4510.00 4520.00 | | 23.937 24.083 | 9.407 8.897 | 2.242 2.186 | 1.06298 |
| 55.667 55.833 | 3350.00 | 40.564300537 40.564300537 | 23.864 | 16.700 16.627 | 2.815 2.811 | 5.98798E-20 6.01425E-20 | 75.500 | 4530.00 | 32.907043457 | 24.083 | 8.824 | 2.177 | 1.13326 |
| 56.000 | 3360.00 | 40.199668884 | 24.083 | 16.117 | 2.780 | 6.20474E-20 | 75.667 75.833 | 4540.00 4550.00 | | 24.083 24.448 | 8.751 8.387 | 2.169 2.127 | 1.14271 1.19239 |
| 56.167 | 3370.00 | 40.345520020 | 23.791 | 16.554 | 2.807 | 6.04074E-20 | 76.000 | 4560.00 | | 24.156 | 9.262 | 2.226 | 1.07972 |
| 56.333 56.500 | 3380.00 3390.00 | 38.668216705 40.126743317 | 23.937 24.593 | 14.731 15.533 | 2.690 2.743 | 6.78836E-20 6.43779E-20 | 76.167 | 4570.00 | | 24.083 | 8.532 | 2.144 | 1.17201 |
| 56.667 | 3400.00 | 39.835037231 | 23.864 | 15.971 | 2.771 | 6.26141E-20 | 76.333 76.500 | 4580.00 4590.00 | | 24.083 24.156 | 8.678 8.459 | 2.161 2.135 | 1.15231 |
| 56.833 | 3410.00 | 39.907962799 | 23.791 | 16.117 | 2.780 | 6.20474E-20 | 76.667 | 4600.00 | | 24.229 | 8.314 | 2.118 | 1.20285 |
| 57.000 57.167 | 3420.00 3430.00 | 39.980892181 39.762111664 | 23.791 23.718 | 16.190 16.044 | 2.784 2.775 | 6.17679E-20 6.23295E-20 | 76.833 77.000 | 4610.00 4620.00 | | 24.156 24.156 | 8.095 8.314 | 2.091 2.118 | 1.23536 |
| 57.333 | 3440.00 | 39.616260529 | 23.791 | 15.825 | 2.762 | 6.31912E-20 | 77.167 | 4630.00 | 32.469486237 | 24.083 | 8.387 | 2.127 | 1.19239 |
| 57.500 | 3450.00 | 39.689186096 | 23.718 | 15.971 | 2.771 | 6.26141E-20 | 77.333 77.500 | 4640.00 4650.00 | | 24.448 24.812 | 8.022 7.584 | 2.082 2.026 | 1.24659 1.31851 |
| 57.667 57.833 | 3460.00 3470.00 | 39.543331146 39.470405579 | 23.791 23.791 | 15.752 15.679 | 2.757 2.752 | 6.34837E-20 6.3779E-20 | 77.667 | 4660.00 | | 24.302 | 7.803 | 2.055 | 1.28154 |
| 58.000 | 3480.00 | 39.543331146 | 23.718 | 15.825 | 2.762 | 6.31912E-20 | 77.833 | 4670.00 | | 24.010 24.083 | 7.949 8.241 | 2.073 | 1.25803 |
| 58.167 | 3490.00 | 39.397480011 | 25.031 | 14.366 | 2.665 | 6.96065E-20 | 78.000 78.167 | 4680.00 4690.00 | | 24.083 | 8.168 | 2.109 2.100 | 1.21349 |
| 58.333 58.500 | 3500.00 3510.00 | 39.543331146 | 23.937 | 15.606 15.533 | 2.748 2.743 | 6.4077E-20 | 78.333 | 4700.00 | 32.104854584 | 24.083 | 8.022 | 2.082 | 1.24659 |
| 58.667 | 3520.00 | 39.324554443 39.178703308 | 23.791 | 15.387 | 2.743 | 6.43779E-20 6.49881E-20 | 78.500 78.667 | 4710.00 4720.00 | | 24.229 24.083 | 7.803 8.022 | 2.055 2.082 | 1.28154 |
| 58.833 | 3530.00 | 39.105773926 | 23.791 | 15.315 | 2.729 | 6.52975E-20 | 78.833 | 4730.00 | 32.104854584 | 24.083 | 8.022 | 2.082 | 1.24659 |
| 59.000 | 3540.00 | 38.959922791 | 23.864 | 15.096 | 2.714 | 6.62439E-20 | 79.000 | 4740.00 | 31.886075974 | 24.010 | 7.876 | 2.064 | 1.26967 |
| 59.167 59.333 | 3550.00 3560.00 | 38.886997223 38.814071655 | 23.864 | 15.023 14.950 | 2.710 2.705 | 6.65655E-20 6.68902E-20 | 79.167 79.333 | 4750.00 4760.00 | 31.886075974 31.959003448 | 24.083 24.229 | 7.803 7.730 | 2.055 2.045 | 1.28154 |
| 59.500 | 3570.00 | 38.668216705 | 23.937 | 14.731 | 2.690 | 6.78836E-20 | 79.500 | 4770.00 | 31.813150406 | 24.229 | 7.584 | 2.026 | 1.31851 |
| 59.667 | 3580.00 | 38.595291138 | 23.937 | 14.658 | 2.685 | 6.82213E-20 | 79.667 79.833 | 4780.00 4790.00 | 32.615341187 31.740224838 | 23.937 24.010 | 8.678 7.730 | 2.161 2.045 | 1.15231 |
| 59.833 60.000 | 3590.00 3600.00 | 38.959922791 38.084808350 | 23.937 24.083 | 15.023 14.002 | 2.710 2.639 | 6.65655E-20 7.14192E-20 | 80.000 | 4800.00 | 31.740224838 | 24.083 | 7.657 | 2.036 | 1.30595 |
| 60.167 | 3610.00 | 38.303585052 | 23.937 | 14.366 | 2.665 | 6.96065E-20 | 80.167 80.333 | 4810.00 4820.00 | | 23.864 24.593 | 7.730 6.928 | 2.045 1.936 | 1.29363 |
| 60.333 | 3620.00 | 38.084808350 | 23.937 | 14.148 | 2.650 | 7.06829E-20 | 80.500 | 4830.00 | 31.813150406 | 24.521 | 7.293 | 1.987 | 1.37125 |
| 60.500 60.667 | 3630.00 3640.00 | 38.011882782 38.084808350 | 23.791 | 14.221 14.221 | 2.655 2.655 | 7.03204E-20 7.03204E-20 | 80.667 | 4840.00 | 31.521446228 | 24.156 | 7.366 | 1.997 | 1.35767 |
| 60.833 | 3650.00 | 37.938957214 | 23.791 | 14.148 | 2.650 | 7.06829E-20 | 80.833 81.000 | 4850.00 4860.00 | 31.740224838 31.740224838 | 24.083 23.937 | 7.657 7.803 | 2.036 2.055 | 1.30595 |
| 61.000 | 3660.00 | 38.011882782 | 24.010 | 14.002 | 2.639 | 7.14192E-20 | 81.167 | 4870.00 | 31.813150406 | 24.083 | 7.730 | 2.045 | 1.29363 |
| 61.167 61.333 | 3670.00 3680.00 | 37.866027832 37.793102264 | 24.010 24.010 | 13.856 13.783 | 2.629 2.623 | 7.2171E-20 7.25528E-20 | 81.333 81.500 | 4880.00 4890.00 | | 24.083 24.156 | 7.584 6.563 | 2.026 1.882 | 1.31851 |
| 61.500 | 3690.00 | 38.376514435 | 23.864 | 14.512 | 2.675 | 6.89069E-20 | 81.667 | 4900.00 | 32.031929016 | 23.645 | 8.387 | 2.127 | 1.19239 |
| 61.667 | 3700.00 | 37.720176697 | 24.010 | 13.710 | 2.618 | 7.29387E-20 | 81.833 82.000 | 4910.00 4920.00 | | 24.083 24.083 | 7.730 7.511 | 2.045 2.016 | 1.29363 |
| 61.833 62.000 | 3710.00 3720.00 | 37.574325562 | 24.229 | 13.346 13.491 | 2.591 2.602 | 7.49316E-20 | 82.167 | 4930.00 | 31.375593185 | 24.156 | 7.220 | 1.977 | 1.3851 |
| 62.167 | 3720.00 | 37.428470612 37.428470612 | 24.229 | 13.491 | 2.580 | 7.41215E-20 7.57596E-20 | 82.333 82.500 | 4940.00 4950.00 | 31.302667618 31.229740143 | 24.156 24.083 | 7.147 7.147 | 1.967 1.967 | 1.39923 |
| 62.333 | 3740.00 | 37.209693909 | 24.010 | 13.200 | 2.580 | 7.57596E-20 | 82.500 | 4950.00 | | 24.083 | 7.147 | 2.036 | 1.3992 |
| 62.500 62.667 | 3750.00 3760.00 | 37.574325562 37.063838959 | 24.083 | 13.491 13.054 | 2.602 2.569 | 7.41215E-20 7.66061E-20 | 82.833 | 4970.00 | 31.156814575 | 24.156 | 7.001 | 1.946 | 1.42838 |
| 62.833 | 3770.00 | 37.063838959 | 23.937 | 13.127 | 2.575 | 7.61805E-20 | 83.000 83.167 | 4980.00 4990.00 | | 24.229 24.229 | 6.928 6.855 | 1.936 1.925 | 1.44342 |
| 63.000 | 3780.00 | 38.814071655 | 24.083 | 14.731 | 2.690 | 6.78836E-20 | 83.333 | 5000.00 | 31.156814575 | 24.156 | 7.001 | 1.946 | 1.42838 |
| 63.167 | 3790.00 3800.00 | 36.917987823 | 24.010 | 12.908 | 2.558 | 7.74717E-20 | 83.500 83.667 | 5010.00 5020.00 | | 24.156 24.302 | 7.366 6.782 | 1.997 1.914 | 1.35767 |
| 63.333 63.500 | 3810.00 | 36.845062256 36.772136688 | 24.083 24.156 | 12.762 12.616 | 2.546 2.535 | 7.8357E-20 7.92629E-20 | 83.833 | 5030.00 | | 24.302 | 6.636 | 1.893 | 1.50687 |
| 63.667 | 3820.00 | 36.772136688 | 24.375 | 12.397 | 2.517 | 8.06617E-20 | 84.000 84.167 | 5040.00 5050.00 | | 25.031 | 5.980 6.709 | 1.788 1.903 | 1.67225 |
| 63.833 | 3830.00 | 36.626281738 | 24.083 | 12.543 | 2.529 | 7.97237E-20 | 84.333 | 5060.00 | | 24.229 25.250 | 5.688 | 1.738 | 1.75801 |
| 64.000 64.167 | 3840.00 3850.00 | 35.969947815 36.626281738 | 24.229 | 11.741 12.543 | 2.463 2.529 | 8.51707E-20 7.97237E-20 | 84.500 | 5070.00 | | 24.375 | 6.563 | 1.882 | 1.52361 |
| 64.333 | 3860.00 | 36.480430603 | 24.521 | 11.960 | 2.482 | 8.36127E-20 | 84.667 84.833 | 5080.00 5090.00 | | 24.229 24.375 | 6.636 6.418 | 1.893 1.859 | 1.50687 1.55824 |
| 64.500 | 3870.00 | 36.334579468 | 24.083 | 12.252 | 2.506 | 8.16219E-20 | 85.000 | 5100.00 | | 24.375 | 6.490 | 1.870 | 1.54073 |
| 64.833 | 3890.00 | 36.407505035 | 24.083 | 12.325 | 2.512 | 8.11389E-20 8.16219E-20 | 85.167 85.333 | 5110.00 5120.00 | 30.646329880 30.719257355 | 24.302 24.521 | 6.345 6.199 | 1.848 1.824 | 1.57615 |
| 65.000 | 3900.00 | 36.334579468 | 24.156 | 12.179 | 2.500 | 8.21107E-20 | 85.500 | 5130.00 | | 24.229 | 7.074 | 1.956 | 1.41366 |
| 65.167 | 3910.00 | 36.188724518 | 24.083 | 12.106 | 2.494 | 8.26053E-20 | 85.667 | 5140.00 | | 24.375 | 6.418 | 1.859 | 1.55824 |
| 65.333 65.500 | 3920.00 3930.00 | 36.188724518 36.115798950 | 24.156 24.083 | 12.033 12.033 | 2.488 2.488 | 8.3106E-20 8.3106E-20 | 85.833 86.000 | 5150.00 5160.00 | 30.719257355 30.500478745 | 24.229 24.229 | | 1.870 1.836 | 1.54073 |
| 65.667 | 3940.00 | 35.897022247 | 24.083 | 11.814 | 2.469 | 8.46449E-20 | 86.167 | 5170.00 | | 24.156 | | 1.870 | 1.54073 |
| 65.833 | 3950.00 | 35.824092865 | 24.229 | 11.595 | 2.451 | 8.6242E-20 | 86.333 86.500 | 5180.00 5190.00 | 30.573404312 30.500478745 | 24.229 24.229 | | 1.848 1.836 | 1.57615 |
| 66.000 66.167 | 3960.00 3970.00 | 35.897022247 35.751167297 | 24.739 24.083 | 11.158 11.668 | 2.412 2.457 | 8.96241E-20 8.5703E-20 | 86.667 | 5200.00 | 30.427551270 | 24.156 | 6.272 | 1.836 | 1.59448 |
| 66.333 | 3980.00 | 36.261650085 | 24.083 | 12.106 | 2.494 | 8.26053E-20 | 86.833 87.000 | 5210.00 5220.00 | | 24.156 24.156 | | 1.914 1.836 | 1.47446 |
| 66.500 | 3990.00 | 35.605316162 | 24.083 | 11.522 | 2.444 | 8.67879E-20 | 87.167 | 5230.00 | 30.719257355 | 24.375 | 6.345 | 1.848 | 1.57615 |
| 66.667 66.833 | 4000.00 4010.00 | 35.459461212 35.459461212 | 24.083 24.156 | 11.376 11.304 | 2.432 2.425 | 8.79005E-20 8.84677E-20 | 87.333 | 5240.00 | | 24.156 24.448 | | 1.882 1.836 | 1.52361 |
| 67.000 | 4020.00 | 35.386535645 | 24.156 | 11.231 | 2.425 | 8.90421E-20 | 87.500 87.667 | 5250.00 5260.00 | 30.719257355 30.427551270 | 24.448 | 6.272 6.199 | 1.836 1.824 | 1.5944 |
| 67.167 | 4030.00 | 35.313610077 | 24.083 | 11.231 | 2.419 | 8.90421E-20 | 87.833 | 5270.00 | 30.500478745 | 24.229 | 6.272 | 1.836 | 1.59447 |
| 67.333 67.500 | 4040.00 4050.00 | 35.386535645 35.313610077 | 24.375 23.718 | 11.012 11.595 | 2.399 2.451 | 9.08112E-20 8.6242E-20 | 88.000 88.167 | 5280.00 5290.00 | | 24.521 23.572 | 5.251 6.563 | 1.658 1.882 | 1.9045 |
| 67.667 | 4060.00 | 35.240684509 | 24.083 | 11.158 | 2.412 | 8.96241E-20 | 88.333 | 5300.00 | 30.354625702 | 24.083 | 6.272 | 1.836 | 1.5944 |
| 67.833 | 4070.00 | 35.313610077 | 24.083 | 11.231 | 2.419 | 8.90421E-20 | 88.500 88.667 | 5310.00 5320.00 | | 24.156 24.156 | 6.199 | 1.824 1.801 | 1.6132 |
| 68.000 68.167 | 4080.00 4090.00 | 35.167758942 35.021903992 | 24.083 | 11.085 11.012 | 2.406 | 9.02137E-20 9.08112E-20 | 88.833 | 5330.00 | 30.208772659 | 24.083 | 6.126 | 1.813 | 1.6324 |
| 68.333 | 4100.00 | 35.386535645 | 24.010 | 11.304 | 2.425 | 8.84676E-20 | 89.000 89.167 | 5340.00 5350.00 | | 24.229 24.083 | 6.126 6.053 | 1.813 1.801 | 1.6324 |
| 68.500 | 4110.00 | 34.948978424 | 24.156 | 10.793 | 2.379 | 9.26519E-20 | 89.333 | 5360.00 | 30.208772659 | 24.083 | 6.126 | 1.813 | 1.6324 |
| 68.667 68.833 | 4120.00 4130.00 | 34.876052856 34.803127289 | 24.010 | 10.866 10.720 | 2.386 2.372 | 9.20301E-20 9.32822E-20 | 89.500 89.667 | 5370.00 5380.00 | | 24.302 23.718 | 5.907 6.199 | 1.776 1.824 | 1.692 |
| 69.000 | 4140.00 | 34.948978424 | 24.083 | 10.866 | 2.372 | 9.20301E-20 | 89.833 | 5390.00 | | 24.229 | 5.761 | 1.824 | 1.7357 |
| 69.167 | 4150.00 | 34.730201721 | 24.083 | 10.647 | 2.365 | 9.39211E-20 | 90.000 | 5400.00 | 29.989994049 | 24.083 | 5.907 | 1.776 | 1.6929 |
| 69.333 69.500 | 4160.00 4170.00 | 34.584346771 34.948978424 | 24.083 | 10.501 10.720 | 2.352 | 9.52256E-20 9.32822E-20 | 90.167 90.333 | 5410.00 5420.00 | | 24.229 24.448 | | 1.751 1.712 | 1.73570 |
| 69.667 | 4170.00 | 34.803127289 | 23.937 | 10.866 | 2.372 | 9.32822E-20 9.20301E-20 | 90.500 | 5430.00 | 30.646329880 | 24.229 | 6.418 | 1.859 | 1.5582 |
| 69.833 | 4190.00 | 34.584346771 | 24.083 | 10.501 | 2.352 | 9.52256E-20 | 90.667 90.833 | 5440.00 5450.00 | | 24.593 24.156 | 5.178 5.834 | 1.644 1.764 | 1.93134 |
| 70.000 | 4200.00 | 34.511421204 | 24.083 | 10.428 | 2.345 | 9.58915E-20 | 91.000 | 5460.00 | 30.062921524 | 24.302 | 5.761 | 1.751 | 1.73570 |
| 70.167 70.333 | 4210.00 4220.00 | 34.438495636 34.438495636 | 24.083 24.156 | 10.356 10.283 | 2.338 | 9.65668E-20 9.72517E-20 | 91.167 | 5470.00 5480.00 | 29.844142914 | 24.083 | | 1.751 | 1.73570 |
| 70.500 | 4230.00 | 34.803127289 | 24.156 | 10.647 | 2.365 | 9.39211E-20 | 91.333 91.500 | 5480.00 5490.00 | | 24.156 24.156 | 5.688 5.688 | 1.738 1.738 | 1.7580 |
| 70.667 | 4240.00 | 34.292644501 | 24.083 | 10.210 | 2.323 | 9.79463E-20 | 91.667 | 5500.00 | 29.771215439 | 24.302 | 5.469 | 1.699 | 1.8283 |
| 70 000 | 4250.00 4260.00 | 34.073863983 34.146789551 | 24.083 24.156 | 9.991 9.991 | 2.302 | 1.00091E-19 1.00091E-19 | 91.833 92.000 | 5510.00 5520.00 | | 24.229 24.229 | 5.615 5.251 | 1.725 1.658 | 1.7808 |
| 70.833 | 4270.00 | 34.146789551 | 24.150 | 10.064 | 2.302 | 9.93658E-20 | 92.167 | 5530.00 | 29.844142914 | 24.156 | 5.688 | 1.738 | 1.7580 |
| 70.833 71.000 71.167 | 4280.00 | 34.000938416 | 24.229 | 9.772 | 2.280 | 1.02332E-19 | 92.333 92.500 | 5540.00 5550.00 | 29.771215439 29.771215439 | 24.156 | 5.615 | 1.725 | 1.7808 |
| 71.000 71.167 71.333 | | 33.928012848 | 24.010 | 9.918 | 2.294 | 1.00827E-19 1.00827E-19 | 92.500 | 5550.00 | 29.771215439 28.823175430 | 24.229 24.229 | 5.542 4.594 | 1.712 1.525 | 1.80427 2.17658 |
| 71.000 71.167 71.333 71.500 | 4290.00 | 33.855087380 | 23 037 | | | | | | | | F 224 | | 1.87842 |
| 71.000 71.167 71.333 | | 33.855087280 33.855087280 | 23.937 23.937 | 9.918 9.918 | 2.294 | 1.00827E-19 | 92.833 | 5570.00 | | 24.302 | 5.324 | 1.672 | |
| 71.000 71.167 71.333 71.500 71.667 71.833 72.000 | 4290.00 4300.00 4310.00 4320.00 | 33.855087280 33.417526245 | 23.937 24.229 | 9.918 9.189 | 2.294 2.218 | 1.00827E-19 1.08829E-19 | | 5570.00 5580.00 5590.00 | 29.698289871 | 24.302 24.302 23.718 | 5.324 5.397 5.907 | 1.672 1.686 1.776 | 1.85304 |
| 71.000 71.167 71.333 71.500 71.667 71.833 72.000 72.167 | 4290.00 4300.00 4310.00 4320.00 4330.00 | 33.855087280 33.417526245 33.855087280 | 23.937 24.229 24.083 | 9.918 9.189 9.772 | 2.294 2.218 2.280 | 1.00827E-19 1.08829E-19 1.02332E-19 | 92.833 93.000 93.167 93.333 | 5580.00 5590.00 5600.00 | 29.698289871 29.625362396 29.552436829 | 24.302 23.718 24.229 | 5.397 5.907 5.324 | 1.686 1.776 1.672 | 1.85304 1.6929 1.87842 |
| 71.000 71.167 71.333 71.500 71.667 71.833 72.000 | 4290.00 4300.00 4310.00 4320.00 | 33.855087280 33.417526245 | 23.937 24.229 | 9.918 9.189 9.772 9.699 | 2.294 2.218 | 1.00827E-19 1.08829E-19 | 92.833 93.000 93.167 | 5580.00 5590.00 | 29.698289871 29.625362396 29.552436829 29.479511261 | 24.302 23.718 | 5.397 5.907 5.324 5.251 | 1.686 1.776 | 1.85304 1.6929 1.87842 1.90451 1.87842 |

Podemos ver mo gráfico 1, em que estão representados esterva lour, que a páqua foi aquecida até t = 100000 1200,00%. Depois de ser utirada dos gottos gobelé oconer o seu ausfecimento, entre para t >00 1240 s. No gráfico Z, estão representados os partos que ditem respeito a este ausfecimento. Em período de arrefecimento. Em presto a este ausfecimento. Em período de arrefecimento.

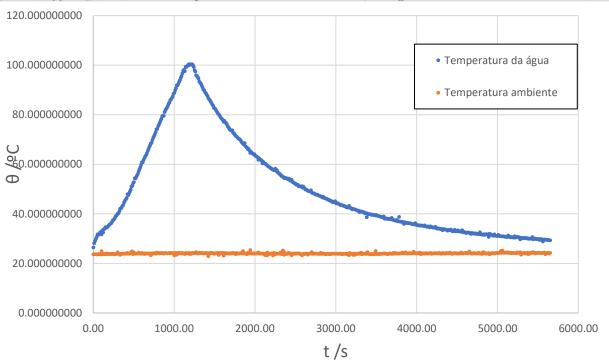


Gráfico 1

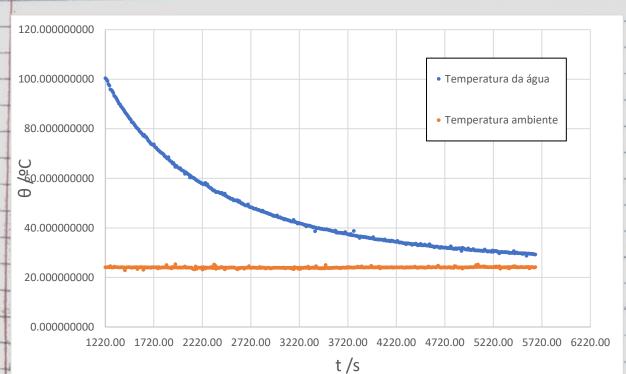


Gráfico 2

Como previsto pela lei do arreferimento de Newton, este gráfico tem tendência exponencial, pelo que se proceden à linearização da equação desta lei;

$$\theta(t) = \theta_{\alpha} + (\theta_{i} - \theta_{\alpha}) e^{-\frac{t}{\tau}}$$

$$\Rightarrow \theta(t) - \theta_{\alpha} = (\theta_{i} - \theta_{\alpha}) e^{-\frac{t}{\tau}}$$

$$\Rightarrow \ln (\theta(t) - \theta_{\alpha}) = -\frac{t}{\tau} t + \ln (\theta_{i} - \theta_{\alpha})$$

Assim, representando en (0(t)-0a) em junção de te calculando os parametros de ajuste eintar, o declive da reta obtida é - 1/2 e a ordenada na origem é en (0; -0a).

$$m = -1 \approx \zeta = -1 \Rightarrow u(\zeta) = 1 \qquad u_{m}(m)$$

$$m^{2} \qquad m^{2}$$

$$en(\theta_{i} - \theta_{a}) = b \approx 0 \qquad (\theta_{i} - \theta_{a}) = e^{b} u(b)$$

Posto isto, proceden-se a uma primeira tentativa de ajuste representada no gráfico 3:

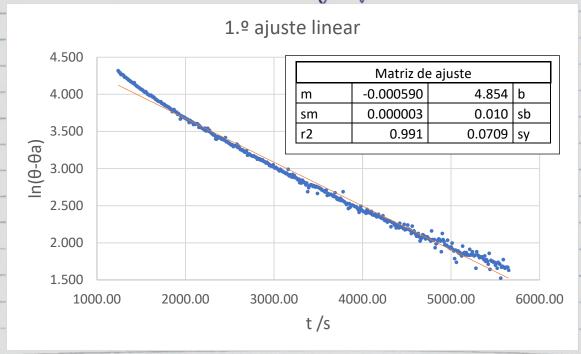


Gráfico 3

No entanto, o gráfico de residuos obtido com este primeiro ajuste tomo (gráfico 4) tem uma clara tondência parabólica, principalmente nos pontos iniciais, pelo que se proceden a uma za tentativa de ajuste, para

t: 3010,00 k, que está representada ma gráfica 5.

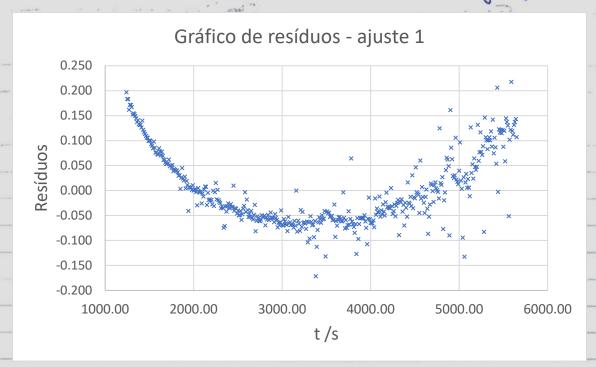


Gráfico 4

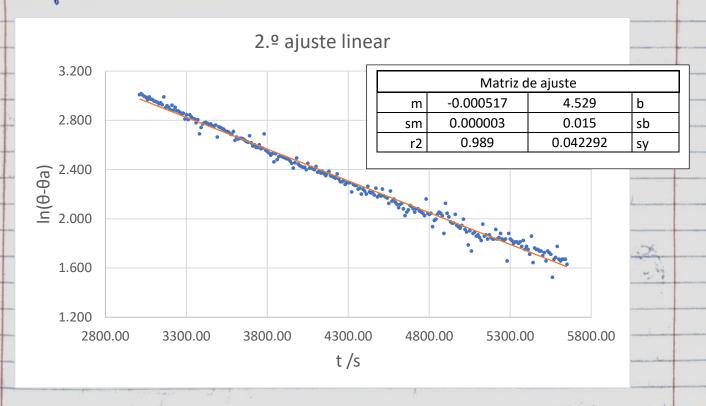


Gráfico 5 - as bouros de incerteza mão se encontram represento * dos porque mão acuscentam informação relevante e la difi cultam a leitura do gráfico. Oro resideres para este segundo ajente, representados no gráfico do 6, parecem ser de atentários. Para atém disso, o valor de nº é elivado (0,989), pelo que este parece ser um ajuste adequado.

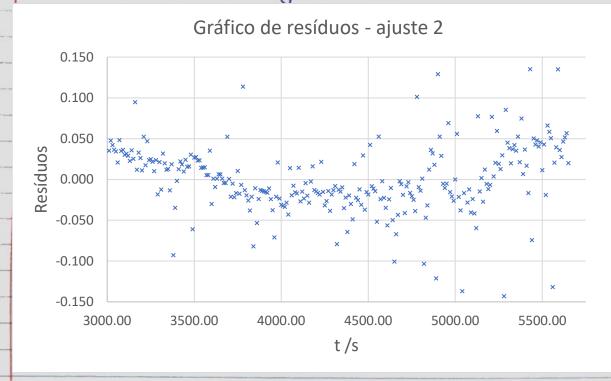


Gráfico 6

Utilizander et parâmetres deste segundo ajuste, esternos: $T = (1935, 94 \pm 3000) \ \Lambda = (92,65 \pm 1,38)^{\circ}$ Oi- $\theta_{0} = (92,65 \pm 1,38)^{\circ}$



Não joi possível comparar o é valor obtido para o tempo de relaxação da água com outros grupos, já que este depende de da marsa de água utilitada: (7 = me), que não foi medida

Experiência Z

Para σ valor de θα, merta seguanda parte da experiência, utilis ou - sel a média dos valores obtidos pelo softwar la "logger ho" apenas durante o período de tempo em que registaram os valores de θ(t) para a parafina (1230,00 s ≤ t ≤ 3320,00 s). Obteve-se θa=(23,989±0,536)°C

No gráfico 7, encontram-se representados es valores de (0-0, a) em junção de t, obtidos para a parafina. As barras de incerteza mão foram representados, já que mão rão visíveis a esta escala.

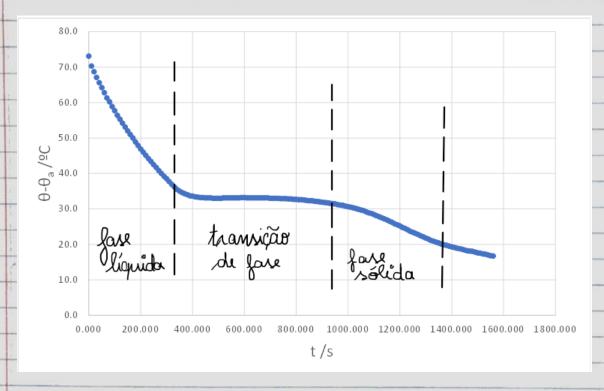


Gráfico 7

Neste gráfico, são claramente visíveis 3 pros partes:

1. a parte h parafina incontra-se mo istado líquido, pelo que

- a sua temperatura desce exponencialmente

> 2. a pare: A compesso parafina istá a solidificar, pelo que

a sua tem peratura se mantém apor a proximadamente es

constante, com pequenas oscilações

3.ª Parte A parafima está emple completamente solidificada,
pelo que a sua temperatura volta a desceride forma expomercial

Os dados atritectos recollidos estão apresentados ma tabela E,
estando sublintados a amarelo aquetes que vamos utilitas,
que dizem respeito à mudança de estado (9 Z.a parte)

| t /s ± 0.001s | θ /ºC ± 0.1ºC | θ - θ _a / $^{\circ}$ C \pm 0.5 $^{\circ}$ C |
|--------------------|---------------|------------------------------------------------------------------------|
| 0.000 | 97.1 | 73.1 |
| 10.000 | 94.3 | 70.3 |
| 20.000 | 92.7 | 68.7 |
| 30.000 | 91.1 | 67.1 |
| 40.000 | 89.6 | 65.6 |
| 50.000 | 88.2 | 64.2 |
| | | |
| 60.000 | 86.8 | 62.8 |
| 70.000 | 85.3 | 61.3 |
| 80.000 | 84.2 | 60.2 |
| 90.000 | 82.9 | 58.9 |
| 100.000 110.000 | 81.7 80.4 | 57.7 56.4 |
| 120.000 | 79.3 | 55.3 |
| 130.000 | 78.2 | 54.2 |
| 140.000 | 77.1 | 53.1 |
| 150.000 | 76.0 | 52.0 |
| 160.000 | 75.0 | 51.0 |
| 170.000 | 74.0 | 50.0 |
| 180.000 | 72.9 | 48.9 |
| 190.000 | 71.9 | 47.9 |
| 200.000 | 70.9 | 46.9 |
| 210.000 | 70.0 | 46.0 |
| 220.000 | 69.1 | 45.1 |
| 230.000 | 68.2 | 44.2 |
| 240.000 | 67.4 | 43.4 |
| 250.000 | 66.5 | 42.5 |
| 260.000 | 65.7 | 41.7 |
| 270.000 | 64.8 | 40.8 |
| 280.000 | 64.0 | 40.0 |
| 290.000 | 63.2 | 39.2 |
| 300.000 | 62.5 | 38.5 |
| 310.000 | 61.7 | 37.7 |
| 320.000 | 60.9 | 36.9 |
| 330.000 | 60.2 | 36.2 |
| 340.000 | 59.5 | 35.5 |
| 350.000 | 59.0 | 35.0 |
| 360.000 | 58.6 | 34.6 |
| 370.000 | 58.3 | 34.3 |
| 380.000 | 58.0 | 34.0 |
| 390.000 | 57.7 | 33.7 |
| 400.000 | 57.6 | 33.6 |
| 410.000 | | 33.4 |
| 420.000 | 57.3 | 33.3 |
| 430.000 | 57.2 | 33.2 |
| 440.000 | 57.2 | 33.2 |
| 450.000 | 57.1 | 33.1 |
| 460.000 | 57.1 | 33.1 |
| 470.000 | 57.1 | 33.1 |
| 480.000 | 57.0 | 33.0 |
| 490.000 | 57.0 | 33.0 |
| 500.000 | 57.0 | 33.0 |
| 510.000 | 57.0 | 33.0 |
| 520.000 | 57.1 | 33.1 |
| 530.000 540.000 | 57.1 57.1 | 33.1 33.1 |
| 550.000 | | |
| 330.000 | 57.1 | 33.1 |
| | | |

| 560.000 | 57.1 | 33.1 |
|----------|------|------|
| 570.000 | 57.1 | 33.1 |
| 580.000 | 57.1 | 33.1 |
| 590.000 | 57.2 | 33.2 |
| 600.000 | 57.2 | 33.2 |
| 610.000 | 57.1 | 33.1 |
| 620.000 | 57.1 | 33.1 |
| 630.000 | 57.1 | 33.1 |
| 640.000 | 57.1 | 33.1 |
| 650.000 | 57.1 | 33.1 |
| 660.000 | 57.1 | 33.1 |
| 670.000 | 57.1 | 33.1 |
| 680.000 | 57.1 | 33.1 |
| 690.000 | 57.1 | 33.1 |
| 700.000 | 57.0 | 33.0 |
| 710.000 | 57.0 | 33.0 |
| 720.000 | 57.0 | 33.0 |
| 730.000 | 57.0 | 33.0 |
| 740.000 | 56.9 | 32.9 |
| 750.000 | 56.9 | 32.9 |
| 760.000 | 56.9 | 32.9 |
| 770.000 | 56.8 | 32.8 |
| 780.000 | 56.8 | 32.8 |
| 790.000 | 56.7 | 32.7 |
| 800.000 | 56.7 | 32.7 |
| 810.000 | 56.6 | 32.6 |
| 820.000 | 56.6 | 32.6 |
| 830.000 | 56.5 | 32.5 |
| 840.000 | 56.4 | 32.4 |
| 850.000 | 56.3 | 32.3 |
| 860.000 | 56.3 | 32.3 |
| 870.000 | 56.2 | 32.2 |
| 880.000 | 56.1 | 32.1 |
| 890.000 | 56.0 | 32.0 |
| 900.000 | 55.9 | 31.9 |
| 910.000 | 55.8 | 31.8 |
| 920.000 | 55.7 | 31.7 |
| 930.000 | 55.6 | 31.6 |
| 940.000 | 55.5 | 31.5 |
| 950.000 | 55.4 | 31.4 |
| 960.000 | 55.2 | 31.2 |
| 970.000 | 55.1 | 31.1 |
| 980.000 | 55.0 | 31.0 |
| 990.000 | 54.8 | 30.8 |
| 1000.000 | 54.6 | 30.6 |
| 1010.000 | 54.5 | 30.5 |
| 1020.000 | 54.3 | 30.3 |
| 1030.000 | 54.1 | 30.1 |
| 1040.000 | 53.9 | 29.9 |
| 1050.000 | 53.7 | 29.7 |
| 1060.000 | 53.5 | 29.5 |
| 1070.000 | 53.2 | 29.2 |
| 1080.000 | 52.9 | 28.9 |
| 1090.000 | 52.7 | 28.7 |
| 1100.000 | 52.4 | 28.4 |
| 1110.000 | 52.1 | 28.1 |
| 1120.000 | 51.8 | 27.8 |
| | 31.0 | 20 |
| | | |

| 1130.000 | 51.5 | 27.5 |
|----------------------|--------------|--------------|
| 1140.000 | 51.2 | 27.2 |
| 1150.000 | 50.9 | 26.9 |
| 1160.000 | 50.5 | 26.5 |
| 1170.000 | 50.2 | 26.2 |
| 1180.000 | 49.8 | 25.8 |
| 1190.000 | 49.5 | 25.5 |
| 1200.000 | 49.2 | 25.2 |
| 1210.000 | 48.8 | 24.8 |
| 1220.000 | 48.5 | 24.5 |
| 1230.000 | 48.1 | 24.1 |
| 1240.000 | 47.7 | 23.7 |
| 1250.000 | 47.4 | 23.4 |
| 1260.000 | 47.1 | 23.1 |
| 1270.000 | 46.8 | 22.8 |
| 1280.000 | 46.4 | 22.4 |
| 1290.000 | 46.1 | 22.1 |
| 1300.000 | 45.8 | 21.8 |
| 1310.000 | 45.5 | 21.5 |
| 1320.000 | 45.1 | 21.1 |
| 1330.000 | 44.9 | 20.9 |
| 1340.000 | 44.6 | 20.6 |
| 1350.000 | 44.4 | 20.4 |
| 1360.000 | 44.1 | 20.1 |
| 1370.000 | 43.9 | 19.9 |
| 1380.000 | 43.7 43.5 | 19.7 |
| 1390.000 1400.000 | 43.3 | 19.5 19.3 |
| 1410.000 | 43.1 | 19.1 |
| 1420.000 | 42.9 | 18.9 |
| 1430.000 | 42.8 | 18.8 |
| 1440.000 | 42.6 | 18.6 |
| 1450.000 | 42.4 | 18.4 |
| 1460.000 | 42.2 | 18.2 |
| 1470.000 | 42.1 | 18.1 |
| 1480.000 | 42.0 | 18.0 |
| 1490.000 | 41.8 | 17.8 |
| 1500.000 | 41.6 | 17.6 |
| 1510.000 | 41.5 | 17.5 |
| 1520.000 | 41.3 | 17.3 |
| 1530.000 | 41.2 | 17.2 |
| 1540.000 | 41.0 | 17.0 |
| 1550.000 | 40.8 | 16.8 |
| 1560.000 | 40.7 | 16.7 |
| 1570.000 | 40.5 | 16.5 |
| 1580.000 | 40.4 | 16.4 |
| 1590.000 | 40.3 | 16.3 |
| 1600.000 | 40.1 | 16.1 |
| 1610.000 | 40.0 | 16.0 |
| 1620.000 | 39.8 | 15.8 |
| 1630.000 | 39.7 | 15.7 |
| 1640.000 | 39.5 | 15.5 |
| 1650.000 | 39.4 | 15.4 |
| 1660.000 | 39.2 | 15.2 |
| 1670.000 | 39.1 | 15.1 |
| 1680.000 | 39.0 | 15.0 |
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And the second

Al Competition of

Personal Control of the Post o

Para estimar o valor da tomperatura de solidifica eão da parafimar, healicamos a média aritmética dos valores selecionados. Podemos ainda calcular a media e a incentra da média: o respetivo desvio padrãe e a incentra da média:

logo, o valor obtido experimentalmente para a temperatura de furão da parafina foi $\Theta_g = (57, 1\pm 0, 2)^{\circ}C$

Considerando to materiale de referencia para esta terripreta taxa



Considerando como valor de referência para esta temperatura 330,0 K = 57,85°C, podemos calcular o eno percentual do valor obtido experimentalmente:

Este eur tem um valor bastante baixo, mas o valor tido como referência mão se encontra no intervalo previsto experimentalmente (56,9°C a 57,3°C), o que se pode dever, por exemplo, a impurezas da parafina utilizada

| | ARE DISABLE STOCK | |
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| - A Fai year Director | a lei de Amferimento de Newton, te | ento para |
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