**Physics Millikan Prep Lab**

**1.** All of these numbers are the product of a random integer and approximately the same non-integer.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 40.9475 | 45.9661 | 16.2458 | 29.9228 | 27.2959 |
| 35.538 | 35.1581 | 18.9561 | 35.1041 | 32.482 |
| 27.3335 | 27.1694 | 29.9297 | 40.6765 | 24.413 |
| 27.2691 | 24.4337 | 38.0671 | 19.0247 | 21.6272 |
| 30.0691 | 24.411 | 10.9304 | 21.8267 | 29.7689 |
| 35.1612 | 27.028 | 24.4105 | 27.233 | 38.0465 |
| 29.7615 | 29.8704 | 40.6529 | 29.9329 | 35.0964 |
| 38.3087 | 29.8171 | 29.9978 | 19.1271 | 46.3732 |
| 37.9816 | 27.29 | 30.0056 | 35.4709 | 27.0478 |
| 38.0714 | 16.3893 | 32.7231 | 21.8214 | 24.3537 |

•On the reverse I have sorted them and made a histogram of them

•What is the step size? (The non-integer) (High step-low step divided by the # of upward transitions or steps)

•What is the uncertainty in your guess? (•The uncertainty will be the range/2 of the most populous step, divided by the number of steps you used to determine the step size.)

**2.** •Show the derivation of an equation for **q** - the charge on a sphere in terms of **** - the density of the sphere, **r** - the radius of the sphere, **d** - the separation of the plates, **V** - the voltage applied to the plates, and **g** - the acceleration of gravity. •Use dimensional analysis (plug in the units to show they cancel) to check your answer. Show this

Useful formulas:

F = m**g**, F = E**q**, **V** = E**d**, Volume of a sphere = 4/3**r**3, **** = m/Volume



Units for Dimensional analysis: (:kg/m3)(r:m)(g:N/kg)(V:Nm/C)(q:C)(d:m)

**3.** •Show the derivation of an equation for **r** - the radius of a sphere in terms of **η** - the viscosity of air, **v** - the terminal velocity of a sphere, **g** - the acceleration of gravity, and **** - the density of a sphere. •Use dimensional analysis (plug in the units to show they cancel) to check your answer. Show this

Useful formulas:

F = m**g**, F = 6η**rv**, Volume of a sphere = 4/3**r**3, **** = m/Volume



Units for Dimensional analysis: (:kg/m3)(r:m)(g:N/kg)(η:Ns/m2)(v:m/s)

|  |  |
| --- | --- |
|  | Sorted |
| 1 | 10.9304 |
| 2 | 16.2458 |
| 3 | 16.3893 |
| 4 | 18.9561 |
| 5 | 19.0247 |
| 6 | 19.1271 |
| 7 | 21.6272 |
| 8 | 21.8214 |
| 9 | 21.8267 |
| 10 | 24.3537 |
| 11 | 24.4105 |
| 12 | 24.411 |
| 13 | 24.413 |
| 14 | 24.4337 |
| 15 | 27.028 |
| 16 | 27.0478 |
| 17 | 27.1694 |
| 18 | 27.233 |
| 19 | 27.2691 |
| 20 | 27.29 |
| 21 | 27.2959 |
| 22 | 27.3335 |
| 23 | 29.7615 |
| 24 | 29.7689 |
| 25 | 29.8171 |
| 26 | 29.8704 |
| 27 | 29.9228 |
| 28 | 29.9297 |
| 29 | 29.9329 |
| 30 | 29.9978 |
| 31 | 30.0056 |
| 32 | 30.0691 |
| 33 | 32.482 |
| 34 | 32.7231 |
| 35 | 35.0964 |
| 36 | 35.1041 |
| 37 | 35.1581 |
| 38 | 35.1612 |
| 39 | 35.4709 |
| 40 | 35.538 |
| 41 | 37.9816 |
| 42 | 38.0465 |
| 43 | 38.0671 |
| 44 | 38.0714 |
| 45 | 38.3087 |
| 46 | 40.6529 |
| 47 | 40.6765 |
| 48 | 40.9475 |
| 49 | 45.9661 |
| 50 | 46.3732 |