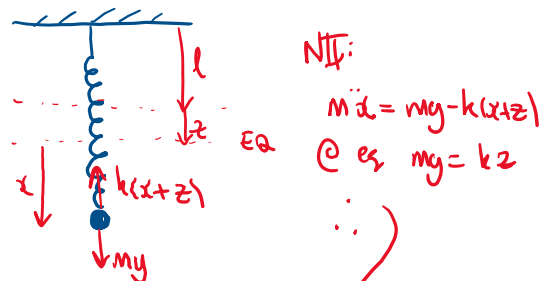


# SHM with springs

Andy French. Winchester College P5. 28/10/2020.

| Mass /g | # of periods | t1 /s | t2/2  | period T /s | 1000*T^2 / 4*pi^2 |
|---------|--------------|-------|-------|-------------|-------------------|
| 50      | 12           | 2.63  | 6.29  | 0.305       | 2.36              |
| 60      | 14           | 2.22  | 6.86  | 0.331       | 2.78              |
| 70      | 7            | 2.94  | 5.44  | 0.357       | 3.23              |
| 80      | 5            | 3.44  | 5.36  | 0.384       | 3.74              |
| 90      | 5            | 8.69  | 10.73 | 0.408       | 4.22              |
| 100     | 6            | 8.52  | 11.12 | 0.433       | 4.76              |
| 110     | 5            | 1.93  | 4.17  | 0.448       | 5.08              |
| 120     | 4            | 2.31  | 4.205 | 0.474       | 5.69              |
| 130     | 6            | 2.65  | 5.59  | 0.490       | 6.08              |
| 140     | 5            | 2.88  | 5.41  | 0.506       | 6.49              |
| 150     | 5            | 2.48  | 5.1   | 0.524       | 6.96              |
| 160     | 5            | 2.36  | 5.07  | 0.542       | 7.44              |
| 170     | 5            | 1.72  | 4.51  | 0.558       | 7.89              |
| 180     | 5            | 1.98  | 4.85  | 0.574       | 8.35              |
| 190     | 5            | 2.53  | 5.47  | 0.588       | 8.76              |
| 200     | 4            | 1.99  | 4.4   | 0.603       | 9.20              |
| 210     | 5            | 1.68  | 4.77  | 0.618       | 9.67              |
| 220     | 5            | 1.75  | 4.9   | 0.630       | 10.05             |
| 230     | 4            | 1.86  | 4.445 | 0.646       | 10.58             |
| 240     | 4            | 2.27  | 4.91  | 0.660       | 11.03             |
| 250     | 5            | 2.17  | 5.52  | 0.670       | 11.37             |

beats  
beats  
beats



NIH:

$$m\ddot{x} = mg - k(x+z)$$

$$\text{@ } e_s \quad mg = kz$$

$\therefore$

$$m\ddot{x} = -kx$$

$$\ddot{x} = -\frac{k}{m}x$$

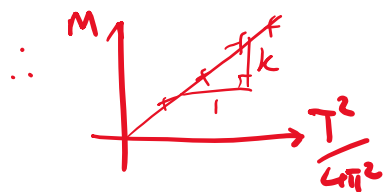
$$\text{SHM: } \ddot{x} = -\omega^2 x$$

$$\therefore \omega = \sqrt{\frac{k}{m}}$$

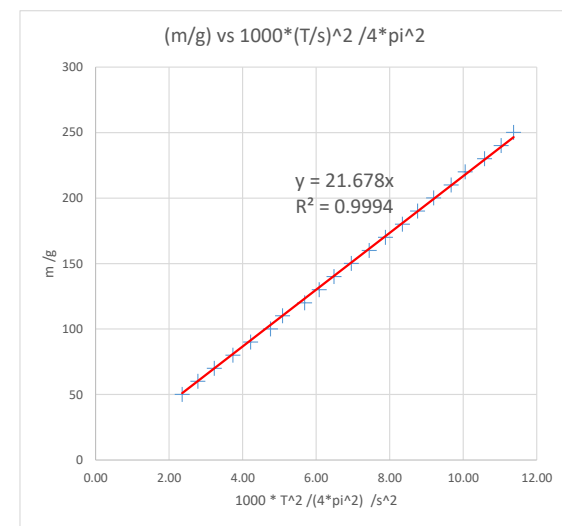
$$\therefore \frac{2\pi}{T} = \sqrt{\frac{k}{m}}$$

$$\therefore 2\pi\sqrt{\frac{m}{k}} = T$$

$$\therefore \frac{m}{k} = \frac{T^2}{4\pi^2}$$



plot M vs  $\frac{T^2}{4\pi^2}$



$$\text{So } k = 21.7 \text{ N/m}$$